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VETERINARY MEDICINE

AUGUST 1943

CONTENTS

Veterinary Progress, Policies and Comment.....281-287

Caribou in Alaska, 281; Extensive Testing for Pullorum Disease in Poultry, 281; Number of Horses and Mules on Farms, 281; Changes in Eggs Caused by Various Temperatures, 281; Nylon Especially Suitable for Sutures, 281; Natural Resistance of Young Animals to Parasitic Infections, 281; The First Year in Two Wars, 282; Xray Examinations for Tuberculous in War Workers, 282; Meat Requirements for Our Armed Forces, 282; Comparison of 1940 War Expenditure with That of 1943, 282; World Map of Communicable Diseases, 282; Agriculture the Biggest War Industry, 282; Use of Beef Blood Serum in Shock and Hemorrhage, 283; A Questionable Benefit, 283; Further Note Concerning an Inexpensive Bacteriological Incubator, 283; A New Weapon Against Insects, 284; The Collection and Publication of Veterinary Vital Statistics Valuable, 284; Idyllic (?) Life on South Sea Islands, 284; Bergman New Dean at Iowa State, 285; Food for Army Dogs, 285; Pet Animal Industry Advisory Committee, 285; Pet Food Order Revised, 286; Refrigeration for Anesthesia, 286; Eichhorn Retires from the Bureau of Animal Industry, 286.

Feed Supply and the Attainment of Production Goals...287

Practical Livestock and Poultry Nutrition.....289

Clinical Observations on Swine Erysipelas in Illinois...293

The Presence of the Lancet Fluke, *Dicroelium dendriticum* in Cattle in the United States.....294

Necrophorus Infection in Cattle.....297

Mastitis in Sheep and Goats a Pasteurellosis.....299

The Status of Hydrogen Peroxide as an Anthelmintic in Dogs 302

Fluid Balance Mechanism in Health and in Shock.....305

Autobiography of a Veterinary Practitioner.....312

Restraint for Castrating Boars.....315

Hemorrhagic Septicemia of Rabbits.....315

Cutaneous Habronemiasis 316

A Day in West Virginia Practice.....316

Rupture of the Pre-Pubic Tendon in a Non-Pregnant Mare 318

Book Reviews 319-320

Diseases of Poultry, 319; Williams Surgical Operations, 319; Textbook of Meat Hygiene, 320; Diseases of Feeder Cattle in Kansas, 320; The Rabbit as Used in Disease Research, 320.

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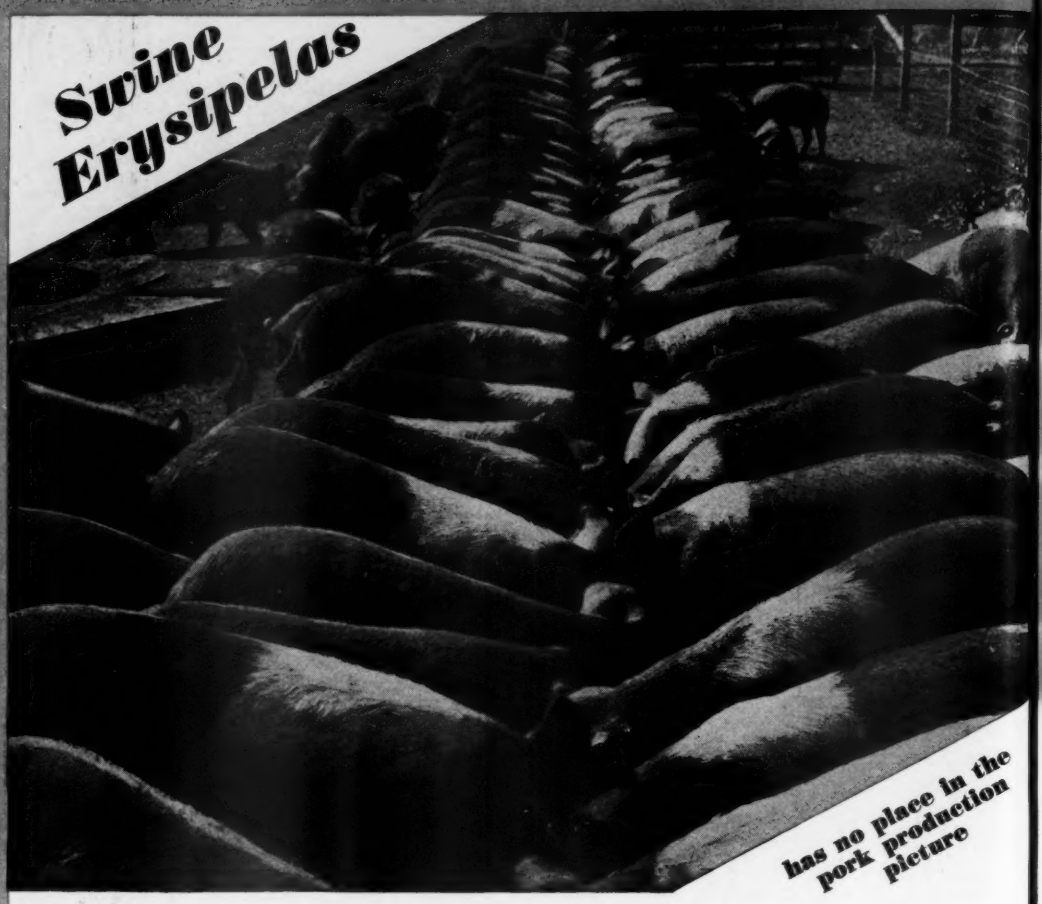

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Composition of cat's milk is water 81.63%, solids 18.37%, protein 9.08%, fat 3.33%, sugar 4.91% and salts 0.47%.

There are said to be between one and two million wild caribou in Alaska available for food—if they can be caught. Caribou meat is said to have the flavor of venison but to be juicy like beef; thus more palatable than either venison or beef.

Certain disease germs grow resistant to penicillin as they do to the sulfa drugs, but Doctors McKee and Houck, of the Squibb Institute for Medical Research, have found that, unlike the result from sulfa drugs, the resistance of these germs following use of penicillin is accompanied by a decrease in their virulence.

In 1942-43 more than 30,000 blood samples from 16,000 birds in 34 flocks were tested with the tube agglutination test in the turkey testing program for pullorum disease control sponsored by the office of the Chief Veterinarian, State Department of Agriculture in Springfield, Illinois, in cooperation with the Illinois Turkey Growers' Association. Nine of the 34 flocks (totaling 1,500 birds) were free from disease. Of the total number of birds tested 2½% were reactors. There were more than twice as many tests made as there were in the 1941-42 program.

As of January 1, 1943, there were 9,678,000 horses and 3,712,000 mules on farms in the United States. This is a fraction over 2½ horses and mules of working age per farm, excluding farms reporting no horses, mules or tractors.

In experiments at Cornell University, grade A eggs dropped to grade B in quality in three days when they were held at 98.6 degrees F.; eight days at 77 degrees; 23 days at 60.8 degrees; 63 days at 44.6 degrees; and 100 days at 37.6 degrees.

Millions of feet of the plastic filament, nylon, formerly produced for tennis rackets and fishing leaders, are now being made for surgical sutures and are being shipped to the United Nations throughout the world. Nylon filaments are solid strands, are inert, non-irritating and do not fray.

As young animals grow to maturity, they normally develop a relatively strong resistance to most species of parasitic worms, a resistance that is sufficient to maintain them in health under ordinary conditions of grazing, wherein they come in contact with infection. This resistance is only relative, however, and may be broken down under a variety of stresses, one of the most important of which is nutritional inadequacy.—E. L. Taylor, M.R.C.V.S., in *Can. Jnl. Com. Med.* 7:1.

The First Year in Two Wars

In the first year of World War I, 366,603 troops were sent overseas (to the British Isles and France). In the first year of the present war 891,827 went overseas (to all parts of the world).

Army freight shipped overseas in the first year of World War I was 1,720,000 measurement tons (average round trip voyage 6500 miles); in this war 10,474,923 measurement tons (average round trip voyage (14,000 miles), and this does not include lend-lease shipments. In the last war our ships carried freight between well organized harbors; in this war they carry freight to dozens of out of the way ports and islands where facilities had to be constructed. The maximum shipment during one month in World War I amounted 450,446 tons. During one month in 1942, 1,554,127 tons were shipped and it is expected that figure will be exceeded greatly during 1943.

The gasoline shipped overseas, during the first 12 months of the present war, was more than 80 times as great as that shipped in the first year of the former period. In that period we shipped one airplane overseas; in the first year of this war many thousands were sent.

During the first year of the former war, American railways handled 2,734,527 troops; during the present war 11,641,838 troops were transported during the first 12 month period and, in addition, buses handled about five million.

From July 1918 to June 1919 inclusive, the railroads handled 11,224,427 tons of army freight; in 1942 they handled approximately 41 million tons. The heaviest monthly movement in the last war was 1,445,535 tons. The heaviest monthly movement last year was approximately 5,600,000 tons.

In addition, shipping, both domestic and export, has in effect been greatly increased in the present war by better utilization of the space available. As an illustration: in World War I the great quantities of pork that went to Great Britain were shipped as Wiltshire sides in refrigerator ships. Now, less than one-third as much space is required to ship the same product as dehydrated pork and lard and refrigerator ships are not required. Eggs are shipped in powdered form and milk as skimmilk powder and butter, effecting even greater savings in transportation than in the case of meat.

★ ★ ★ ★

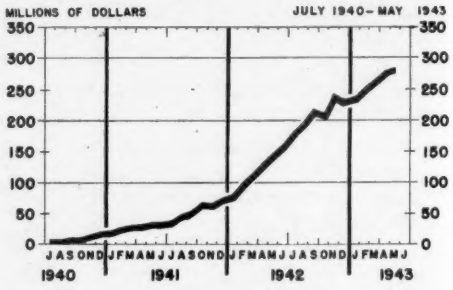
The U. S. Public Health Service has made more than 160,000 X-ray examinations of workers in war industries for *tuberculosis* since the war began.—*S. N. L.*

★ ★ ★ ★

Allowing for 16 ounces of meat per day for each man in our armed forces, and considering that at the end of the year we shall probably have 10,420,000 men in those forces, it is estimated that the meat requirements for them will be between 3,000,000,000 and 3,500,000,000 pounds during 1943.

★ ★ ★ ★

U.S. WAR EXPENDITURES DAILY RATE



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In the offices of the Division of Medical Intelligence of the Army there are on the walls maps of the world showing last minute data on the location of the various communicable diseases. Extensive outlines of the diseases likely to be met are prepared and given to medical officers before embarkation to the battle front.

★ ★ ★ ★

Agriculture has become the biggest war industry of all. It must feed both war machines and human machines. Hemp, castor oil, casein fibers, synthetic rubber and materials for plastics that, to withstand temperatures from 170° above to 50° below zero without blistering or cracking, softening or warping, are illustrations of raw materials our farms must feed to the war machines.

★ ★ ★ ★

★ ★ ★ BUY WAR SAVINGS STAMPS AND BONDS

Use of Beef Blood Serum in Shock and Hemorrhage

That beef blood serum may supply globulin and thus be a possible aid in preventing the often fatal drop in blood pressure which follows severe shock or hemorrhage, was announced recently by Dr. Eric Ogden of the University of California.

Renin is always secreted by the kidneys in cases of shock or hemorrhage. If either condition is prolonged, the supply of globulin—a renin activator that produces a pressor substance (angiotonin) may become exhausted. Globulin exhaustion causes a further drop in blood pressure which may prove fatal. Since beef blood serum contains this renin activator, globulin, injections of such serum may be used to prevent collapse of the blood pressure. It was suggested by the doctor that in case of hemorrhage or shock human blood plasma used for transfusion be fortified by an activator from ox plasma or that in emergency it be substituted for human plasma to prevent drop in blood pressure.

A Questionable Benefit

There is considerable agitation among members of the veterinary profession in Great Britain over a proposed amendment to the Veterinary Surgeon's Act, by which quacks are to be put on the official subsidiary Register of the Royal College of Veterinary Surgeons.

One practitioner has written to the *Veterinary Record* that had the amendment been framed by the quacks themselves it could not have better suited them—that apart from everything else its effect on the student outlook must be disastrous. Another veterinarian criticized the section of the proposed amendment in which length of time in practice is given as the sole effective criterion in deciding if an unqualified person were suitable for registration; that such registration is a remarkable reward for bluff through the years; that for the Council of the Royal College of Veterinary Surgeons to register people with the length of time of practice, regardless of competence, as the only requisite, is nothing less than immoral and will involve the R.C.V.S. in an act of true quackery; and also that the name "Animal Practitioner" (as the registered quack is to be designated) conveys more to the layman than does "Veterinary Surgeon."

On the other hand another veterinarian says: "It would seem that we ought to view the bill in general as a long-term policy measure designed for the eventual freedom of the profession and one which has been produced and sponsored, not without sacrifice, by the present generation of veterinarians for the betterment of the next and for the protection of the public as a whole."

A Further Note Concerning an Inexpensive Bacteriological Incubator

Recently my attention has been called by Dr. R. S. Breed, Chairman of the Dairy Products Committee of the American Public Health Association, to the fact that the incubator described in VETERINARY MEDICINE 36:11, pp. 367-368, 1941, does not meet the standards fixed for incubators in the 1941 or eighth edition of "Standard methods for the examination of dairy products". For all who desire to make *official* standard plate bacteria counts of milk and dairy products, I recommend that they have such counts made by a laboratory using such technic and having such equipment as approved by the American Public Health Association.

The incubator described was used for and intended as a piece of equipment in the field—in regions lacking laboratory facilities—for the purposes indicated; thus serving as a useful adjunct in determining the udder health of lactating cows, as a check upon the efficiency of udder infusion treatments for streptococcic mastitis and as an aid in quickly screening out, because of high bacteria count, the poorer milk producers. Counts so made are not official but are extremely helpful in the correction of high bacteria counts in farm milk. The results obtained during the past two years, using such checks, indicate that the value of this incubator for these purposes is fully as great as indicated in the article to which reference is made above—but it does not meet the standards established for *official* plate counts.—*C. S. Bryan.*

A New Weapon Against Insects

The Department of Agriculture has developed an aerosol or fine-fog method of dividing and spreading insecticides, that is disastrous to certain insects — especially mosquitoes, flies and many other household insects and greenhouse pests.

The method is far more effective, convenient and economical than the old-time spray, and promises improvements and wider use. The discovery includes principally an insecticide material with an activator that makes the mixture work better, dissolved in a highly volatile solvent which propels and atomizes the insecticide into a fog, all in a container which keeps the mixture under high pressure ready for instant release.

The solvent evaporates almost instantly, leaving the infinitesimal particles of the insecticide suspended in the air as an aerosol. This fine suspension is non-toxic to man and animals and non-inflammable, but highly toxic to insects—so toxic that it acts with the speed of a gas fumigant.

Containers or "bombs" of improved designs are being manufactured now in great numbers and, filled with the mixture, more than a million are on their way or already in use on the fighting fronts of Africa, the Pacific and elsewhere to protect men against the irritations and dangers of mosquitoes, flies and other insects.

Already, in addition to its use on mosquitoes and flies, the method has been tried on other household insects, some greenhouse pests and the adult stage of the cheese and ham skipper. Regardless of the insecticide used, which depends upon the pest to be killed, the method consists essentially in mixing the killing agent with a liquefied gas, dichlorodifluoromethane, the complete mixture going into a strong steel container for release in small "puffs" when needed. With pyrethrum, sesame oil is used as a synergist—it doesn't take part in the actual job of killing insects but makes the pyrethrum more effective for that purpose. The very volatile chemical, dichlorodifluoromethane, provides the spraying pressure, so that a pound "bomb," such as is now used by soldiers at the front, can be used by means of a simple thumb release to put out enough puffs to kill each day for 50 days all the mosquitoes in ten rooms each 10 feet square and 10 feet high.

To illustrate killing power, one puff containing 1 milligram of total pyrethrins (a particle smaller than a mustard seed) applied this way will kill every yellow fever mosquito in 1,000 cubic feet of space in 5 minutes.

There are good prospects of developing means of applying aerosols of nicotine, rotenone and other insecticides on truck crops. Dr. P. N. Annand, chief of the Bureau of Entomology and Plant Quarantine, said "these new developments have not only been just what was needed by the military forces, for control of disease-carrying insects and to extend the supplies of pyrethrum and some other insecticides, but they give promise of providing a better control weapon for use all along the front in man's never-ending war against insects. It is unfortunate that the method is not yet available for civilian use, but that will come later."

* * * *

The collection and publication of veterinary vital statistics offers greater opportunity for acquainting the public with the value of, and the need for, skilled veterinary service than any other means available to the profession. Such statistics also are of value to the profession.

* * * *

Idyllic (?) Life on South Sea Islands

The importance of insects to human life has come to be appreciated only since our war with Spain in 1898. They cause more discomfort, more disabilities and more deaths (in the tropics) than do all the wild animals and venomous reptiles that we have been taught to dread. Suspicion of their role as disease carriers was expressed before the Christian era but not proved until the present century. Ticks, flies, lice, chiggers, fleas, mosquitoes and the voracious hordes which come to feed on man and his food thrive with special vigor in hot countries.—Capt. Lucius W. Johnson in *Hygeia*.

* * * *

★ ★ ★ BUY WAR SAVINGS STAMPS AND BONDS

Bergman New Dean at Iowa State

H. D. Bergman

Appointed by the President of Iowa State College as the fourth dean of the Division of Veterinary Medicine, Doctor Bergman assumed the duties of the office July 1, succeeding Dean Charles Murray.

A graduate, 1910, of the Veterinary Division of the college, he has devoted his time and energy through the intervening years as a faculty member of his Alma Mater. He was made a Professor and Head of the Veterinary Physiology and Pharmacology Department in 1916. The Doctor has not confined himself to scholastic interests but, among other activities, has taken a prominent part in the athletic life of the college—serving as a member of the Athletic Council and as the Big Six faculty representative.

During this period, as is often the case with busy men, Doctor Bergman has served unstintingly in many capacities in numerous veterinary organizations, achieving the distinction of being elected President of the American Veterinary Medical Association—serving the term 1938-39.

The new Dean took to his latest responsible position a wealth of experience in veterinary matters which augurs well for the successful fulfillment of his newly acquired duties in the Nation's oldest School of Veterinary Medicine.

* * * *

Dog food is purchased for army dogs subject to federal specifications which have been developed by the Animal Service Branch of the Veterinary Corps, Office of the Surgeon General, in cooperation with the Agricultural Research Center, Beltsville, Maryland, and with members of the dog food industry.

* * * *

Pet Animal Industry Advisory Committee

Appointment was made on June 11, of a permanent Pet Animal Industry Advisory Committee to assist in working out problems incident to Food Production Order No. 7, which controls protein content of pet foods and limits the quantity of such foods that can be manufactured.

When the order was originally issued, early in 1943, several members of this industry were consulted and it was deemed advisable to appoint a permanent advisory committee because of the need for working out educational problems, not only deriving from the order itself, but regarding ways and means of informing pet owners how to feed animals under wartime restrictions consistent with the over-all food supply situation.

The functions of the committee will be to work out ways of meeting feeding requirements of the animals concerned, including the quality and quantity of foods permitted under FPO No. 7; to carry out educational efforts to inform pet owners how best to use available pet foods; and to work out problems incident to a sane breeding control program during the war.

Tuesday, June 15, in Washington, the committee was formally organized and held the first official meeting and various problems were discussed, including nutrition, breeding control and educational efforts.

The committee is composed of representatives of pet food manufacturers and include: E. D. Griffin, Allied Mills, Chicago, Ill.; C. M. Olson, Swift and Company, Chi-

cago; W. E. Armstrong, Gaines Food Company, Sherburne, N. Y.; Troy V. Cox, Albers Milling Company, Seattle, Washington; Waller Mole, Old Trusty Dog Food Co., Needham Heights, Mass.; Cyrus Gambrill, Dietrich and Gambrill, Frederick, Md.; John O'Neal, Security Mills, Knoxville, Tenn.; O. E. M. Keller, Kasco Mills, Toledo, Ohio; Harry Lustine, Washington, D. C. Representatives of affiliated interests are to be consulted in formulating a plan of procedure.

Pet Food Order Revised

The provisions of Food Production Order No. 7,* which limited the amount of animal protein for use in pet food—effective only until June 30th, have been continued in Food Distribution Order No. 58 with minor changes which are briefly: manufacturers production quotas are to be determined on a yearly basis and the definition of "pet foods" specifically includes "processed meat products" intended for animal pet consumption—limitations as to the amount of protein (both animal and total) remains the same. Pet foods supplied to the Armed Forces remain exempt from the restrictions.

Refrigeration for Anesthesia

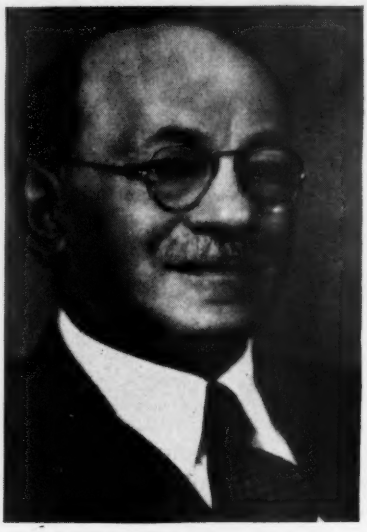
Refrigeration of the part as a means of anesthesia in amputations has been receiving increasing attention in human medicine for more than a year. By cooling the member to near the freezing point amputation of, for example, a leg can be made painless, bloodless and without shock. Freezing, however, must be avoided and cooling for one to two hours is required for complete anesthesia. A tourniquet is applied in the beginning of the refrigeration. Application of ice or ice water, near freezing, to the limbs, is harmless. There is a temporary suspension of animation (and of bacterial growth) which may be maintained for several hours, perhaps as much as 48 hours, without interference with the resumption of cellular activity when the temperature returns to normal.

Anesthesia by refrigeration has been used in the Medical Corps of the Army, for areas from which skin was taken for grafting.

Vet. Med., 37:3, p. 84.

Eichhorn Retires from Bureau of Animal Industry

Although official retirement of Doctor Eichhorn from the Bureau does not take place until October 30th, on account of accumulated annual leave it, in effect, began July 1st, at which time a farewell dinner at the Mayflower was given in his honor by members of the District of Columbia Veterinary Association and veterinarians of the Bureau.



Adolph Eichhorn

Except for 21 years as director of the Veterinary Department of Lederle Laboratories, Doctor Eichhorn has served continuously in the B.A.I. since 1901. The last assignment, which he has held for five years, but is now relinquishing, was that of director of the Animal Disease Research Station at Beltsville, Maryland.

As a recipient, in 1941, of the Twelfth International Veterinary Prize, Adolph Eichhorn achieved the highest honor that can come to a veterinarian in this country.

The doctor has no particular plans for the future, but hopes to take an active part in the rehabilitation work after the war—along his line of experience.

Feed Supply and the Attainment of Production Goals

By J. W. Patton
East Lansing, Mich.

THE Food Administrator has asked for an increase in the number of meat producing animals, including birds. We undoubtedly require more meat, more milk, more butter, more poultry, more eggs, etc. There are two ways by which this increase may be obtained: (1) by increasing the number of food producing animals and (2) by better methods of care and feeding and better producing animals.

For decades our federal and state agricultural experimental stations have taught the theory of fewer animals doing a better job of production. Following this line of endeavor, the poultry breeder has raised the productivity of our domestic fowl from a few dozen eggs to those that lay in excess of 300 eggs in a year. The industry has striven for the production of 500-pound butter fat cows to replace those producing 250-pounds. Our hog breeders have bred for larger litters, rapid growth and early maturity. While the agronomist was seeking to make two blades of grass grow where one grew before, the animal husbandman strove for one animal that would do the work of two. The reason being economy. It is more economical to produce 200 eggs with one hen than it is to produce them with two hens. It is more economical to produce 500 pounds of butter fat with one cow than the same amount with two cows. These goals were made possible first by the geneticists who bred more prolific and more rapidly maturing strains of animals and by the nutritionists who provided the material which enabled these improved animals to attain somewhere near their maximum potentials.

It must be remembered that meat, milk, butter, eggs, etc., are animal by-products in the sense that they are products after body maintenance. Farm animals are converters of raw material into finished products. They are relatively good or poor converters depending upon their production potentials and the raw material fed to them for conversion into finished products, but even good converters — efficient, well fed animals—use up about half of the feed consumed in body maintenance. This maintenance ration is waste so far as production is concerned. On a poor diet, the percentage of waste is much greater. It is also greater when the feed is consumed by inefficient converters of crude feed into refined human food.

Before the national emergency, we had a state of relative equilibrium between the number of animals to be fed and the feeds from which maximum potentials could be obtained. When we entered this emergency we raised our requirement for production to feed ourselves and for our Allies. At the same time, the amount of raw material (feed) available to be converted into finished products was decreased. This means that we are expected to produce more and have less from which to produce it. It is one thing to demand increased billions of eggs and millions of pounds of butter or meat and another thing for our animal industry to produce them with no extended facilities or increase in its raw material. The need for an enlarged plant was recognized and a program for raising more animals was launched. But no provision was made for an increase in critical raw materials—proteins—and now the livestock industry is expected to feed more animals with less feed of poorer quality.

The scientific breeder has made available to the livestock raiser an animal with a greatly increased productive capacity, the scientific nutritionist has worked out the nutritive requirements of this more efficient converter of crude food products into refined foods and the feed manufacturing industry has assembled the ingredients from all over the country—fish meal from the coasts, oil cake from the soybean, linseed and cotton seed processors, meat scrap from the packers, tankage here, alfalfa there, etc. — and compounded and made available to the livestock raiser all the improvements in feeds and feeding methods developed by the agricultural experiment

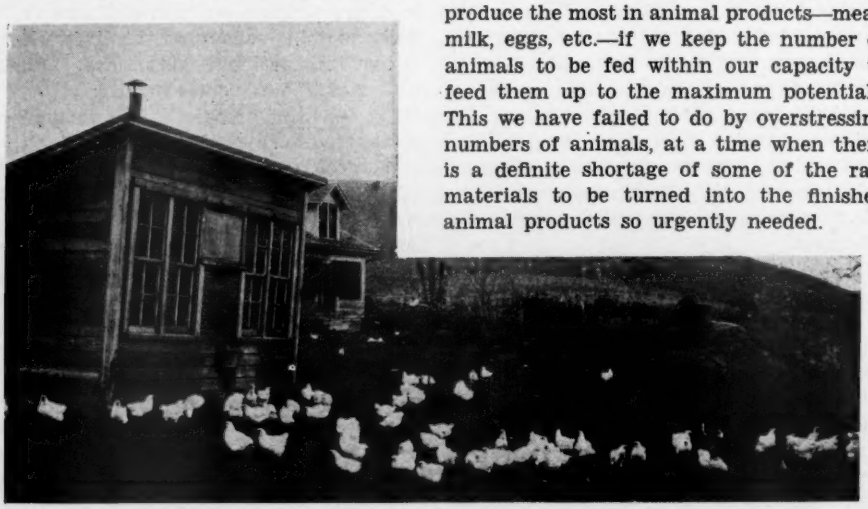
stations. Thus was made possible the attainment of the potential production bred into our improved farm animals and poultry. The whole trend in recent decades has been toward the goal of greater production from relative fewer animals. This has necessitated both better animals and better feeds.

Now we are asked to turn the clock backwards; to reverse this trend; to feed larger numbers of animals with poorer feeds, i.e., to spread our limited amount of good feed thinner, and feed more animals less efficiently. Our stepped up production of animals is out of balance with our feed supplies.

This national emergency came upon us at a time when we were becoming nutrition conscious. We had reached the stage of believing that many of our disease problems had their origins in a faulty or inadequate diet. We had come to realize that many animals were suffering from one kind or another of nutritional inadequacy. While it is true that a majority of the high producing animals were being fed on diets made up scientifically in accordance with the production requirements, it is likewise true that a greater number of ordinary animals were being fed on a border line or subadequate diet in relation to their production. To the veterinarian that meant that many of the disease problems that he was called upon to solve had their bases in inadequate nutrition or were complicated by this factor. If this were true in the past, and it undoubtedly was, it is true to a greater degree now, and the condition must become intensified because of the attempt to push a greater number of animals for high production on a less adequate diet.

The scientific feed manufacturer who heretofore has furnished the wherewithal for rapidly increasing animal production, now finds himself forced to shut down for lack of materials or to produce inferior feed because of scarcity of essential materials. The feeder, neither by training nor experience, is capable of compounding this high production feed stuff. It does not help to attain our production goal to find out that while we have the animals to be fed we do not have the means to feed them efficiently. It does not help the farmer attempting to produce larger litters of pigs to find out that he can not procure scientifically compounded feeds. The scientific feed manufacturer, in the past, has supplied a concentrate which enabled the farmer to supplement his home grown feed and thus achieve the best results from it. This supplement in a large degree is not now available. It means that the feeder must feed his home grown grains less efficiently, must feed more animals below their hereditary growth and production potentialities.

We have only so much feed stuff. It will produce the most in animal products—meat, milk, eggs, etc.—if we keep the number of animals to be fed within our capacity to feed them up to the maximum potentials. This we have failed to do by overstressing numbers of animals, at a time when there is a definite shortage of some of the raw materials to be turned into the finished animal products so urgently needed.



Practical Livestock and Poultry Nutrition

Minerals

By L. D. FREDERICK* and R. E. GRAY*
Chicago, Illinois

IT is just as important that a good ration contain adequate amounts of all the necessary minerals, including calcium and phosphorus, as well as the trace elements, as it is that it contain an adequate amount of high-quality protein and all the essential vitamins. Growth, milk production, egg production or hatchability, may all be affected by deficiencies of any of the several mineral elements known to be required for nutrition. Furthermore, in some localities the soil is deficient in one or more of the necessary minerals. This may be true, particularly of the so-called trace elements —minerals which occur, and which are required, in only very small amounts. Example of such deficiencies are: Iodine in the middle west, cobalt in Michigan, Australia and certain other localities, copper, iron, and manganese. It is especially important that the veterinarian know whether any of these essential minerals, or others mentioned later, are deficient in the territory in which he practices. If any such deficiencies are known to exist, he should advise the addition of small amounts of that particular mineral to the rations.

Calcium and Phosphorus.—Both of these minerals are necessary for the development of sturdy bones and good teeth in the growing animal. Phosphorus, particularly, is required for the normal maintenance of certain body functions. Both of these minerals are essential for pregnant or lactating females, also for hens in heavy egg production. Since much of the phosphorus is utilized in combination with calcium, the proper blend or ratio of these minerals is extremely important. In practice, a ration usually contains from about 1.2 to 1.8 parts of calcium to 1 part of phosphorus.

Salt.—Common salt has long been recognized as a dietary essential for herbivorous animals and for poultry. The sodium element of salt appears necessary to regulate the pressure of the body fluids upon cell membranes. It also helps to maintain the important alkaline reserve. The chlorine element is an important constituent of the digestive juices, and aids in activating the digestive enzymes. From 0.5 to 1% of salt is usually added to mixed feeds. It is customary also to supply it in block form for cattle, so that they may regulate their consumption of it according to their individual needs.

Trace Elements.—In addition to the above minerals which are required in relatively large amounts, there are a number of others of which small quantities only are needed. A deficiency of any one of these will seriously affect the utilization and function of all the others in the various body processes and result in lowered efficiency from all angles: growth, reproduction, lactation, etc. Deficiencies of many of the trace elements have occurred at one time or another, and may reoccur at any time, especially under the conditions set up by present-day intensive farming.

There is not much chance for an animal deficient in any one of the trace elements to calve triplets as there is lowered efficiency in reproduction

Magnesium.—Magnesium is involved in the building of sound bones, and is essential in certain other body functions. Usually this element occurs in sufficient quantities in ordinary feedstuffs.

Iron.—This element is necessary for proper formation and maintenance of an adequate

*Research laboratories, Swift & Company, Chicago, Illinois.

supply of good red blood. It is an integral part of hemoglobin, the constituent in blood which distributes oxygen throughout the body.

Copper.—Copper is essential for the proper utilization of iron in the formation of blood cells. Copper has been said to be a teammate with iron in preventing and curing nutritional anemia. It also aids in the proper functioning of cell action. This element is required in only very small amounts. Larger amounts may be poisonous.

Manganese.—Manganese is known especially for its relation to perosis or "slipped tendon" in poultry. Numerous studies have been made in which managanese effectively prevented this form of leg weakness. The presence of small amounts of this element is also essential for proper lactation and certain other body functions. For high hatchability of eggs manganese is necessary.

Iodine.—Iodine is important for the proper functioning of the thyroid gland. It prevents goitre in animals, and also the condition known as "hairless pigs."

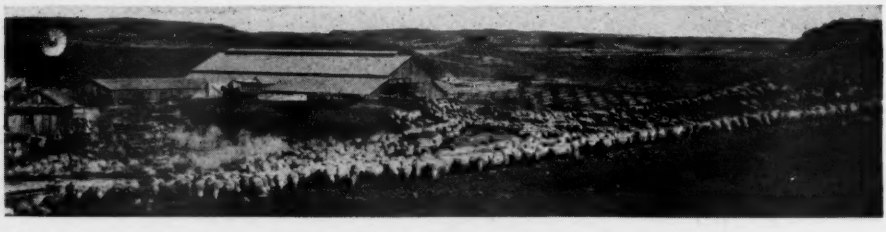
General.—While it is important to have enough of each of the mineral elements in a well-balanced mixed ration, it is just as important not to have too much of any of them. An excess would represent at best an economic waste. Not only must the animal excrete the excess but it may have a detrimental or even a poisonous effect upon the animal. This is particularly true of the trace elements.

VI. Vitamins

Vitamins are substances occurring naturally in all living matter, in quite small amounts. It is impossible for living things to continue to live and function normally without them. Plants may manufacture their own stores of these materials, but it is necessary that most of them be supplied in the feed of animals. Normal digestion of feed, and maintenance of the body in a healthy condition, are impossible without adequate amounts of the vitamins in the ration. It should be emphasized again that these substances occur in only small amounts—in amounts often so infinitesimal that it is rather difficult to measure the quantity present in any given material. Some of the vitamins are easily destroyed by heat or by prolonged exposure to air.

The importance of supplying vitamins in poultry and livestock rations has become increasingly recognized in recent years. Our knowledge of the vitamin requirements of the various animals is being added to constantly. The fact that many animals have little or no access to their natural feeds—range grasses, bugs, worms, etc., makes it even more necessary that they receive a ration complete in all the known requirements of the specific animals. The wide variety of feed ingredients available at the present time, some of which are by-products of industry containing little or none of the important vitamins while others contain some of the vitamins in concentrated amounts, make it essential for the veterinarian to know something of their vitamin content before advising their use. It is just as necessary to know the vitamin content of ingredients considered more or less standard in mixed feeds. During periods of high prices one may be tempted to lessen the percentage of certain items in a feed. Unless this is done intelligently more harm may be done to the quality of the feed than is gained by any saving in cost, thus making the feed, in gains produced, more instead of less expensive.

The vitamins are all more or less directly related to the growth and general well-being of the animal. However, each appears to have some specific function in normal



nutrition. Some of the more widely recognized and better established vitamins will now be dealt with individually and in some detail.

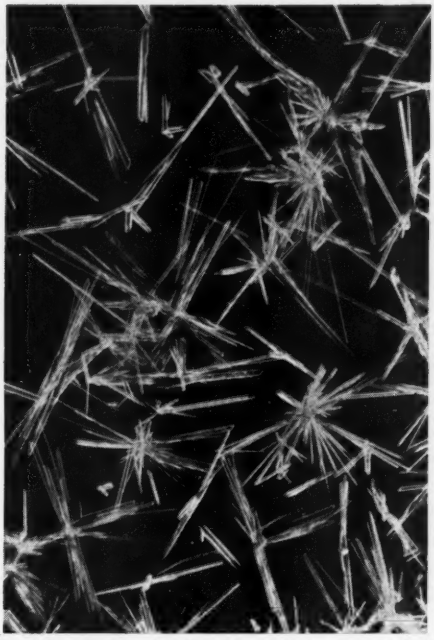
Vitamin A.—This vitamin occurs naturally only in certain animal products such as liver and the fish-liver oils or other fish oils. A special form of the vitamin, carotene, is found in vegetable and cereal materials. It is usually associated with highly colored substances, particularly in bright green, yellow or orange colored vegetable tissues. The animal is able to transform carotene secured from its feed into vitamin A through the action of the liver.

Vitamin A has sometimes been called the anti-infection vitamin because of its action in aiding the maintenance of normal mucous membranes, particularly in the respiratory tract, thus aiding resistance to infection. It also tends to promote maximum growth when present in the ration in adequate amounts, and appears to be essential for reproduction and lactation. This vitamin has a special function in helping to maintain vision in dim light, and in making possible the rapid adjustment of vision to changes in light intensity.

Stunted growth, or lowered resistance to infection, are probably the first symptoms of vitamin A deficiency. "Night blindness" may become evident in cattle. In swine and young chickens incoordination may result from a vitamin A deficiency. In this condition, the animal appears unable to coordinate its movements and staggers around as if in a drunken stupor. It is possible to prevent this deficiency, of course, by using adequate amounts of fish oil, yellow corn, or good quality alfalfa meal in the formulation of a mixed ration. If the animal has access to green pasture, it may obtain additional amounts from this source.

Thiamin (Vitamin B_1).—This vitamin appears to be essential to the normal digestion and utilization of carbohydrates. It tends to promote a healthy nervous system, and is necessary for growth, reproduction and lactation. Early symptoms of a deficiency of thiamin in the ration include loss of appetite, poor growth or loss in weight. Later, paralysis occurs, followed by death, if corrective measures are not taken. Ruminants (cattle and sheep) are able to manufacture limited amounts of this vitamin through bacterial action in the rumen, in much the same manner as they are able to manufacture proteins from urea.

Ordinarily, most mixed rations contain adequate amounts of whole grains so that there is no danger of a deficiency of this vitamin. If a deficiency is suspected, however, dried brewer's yeast or wheat germ may be used as concentrates to supply the required amount of vitamin B_1.



Crystals of vitamin B_1—the vitamin essential to normal digestion and utilization of carbohydrates

Vitamin C.—There is no evidence that normal farm animals require this vitamin in amounts over that furnished by ordinary feedstuffs.

Riboflavin (Vitamin B_2 or G).—In general this vitamin promotes growth, good health, proper digestion, prevents abnormalities in the nervous system and appears to be related to a normal skin condition.

A deficiency of riboflavin in poultry rations results in slow growth, "curly-toe paralysis," as well as lowered egg production and hatchability. In pigs the symptoms of

such deficiency are slow growth, diarrhea and nerve degeneration. As in the case of thiamin, cattle and sheep appear able to manufacture limited amounts of riboflavin.

Rich sources of riboflavin are liver meal, dried brewer's yeast, certain dried fermentation solubles, dried milk by-products, alfalfa and meat scrap.

Nicotinic Acid (Niacin).—This vitamin has not been shown to be essential for poultry. A deficiency in swine rations appears to increase the susceptibility of the animal to necrotic enteritis.

Rich sources of nicotinic acid or niacin are liver meal, dried milk by-products, meat scraps and tankage.

Pyridoxin (Vitamin B_6).—The requirements for this vitamin are not known at the present time, although it does appear to be essential for some animals. It is usually found associated with riboflavin and nicotinic acid.

Pantothenic Acid (Filtrate Factor).—The comment made for pyridoxin applies equally in the case of pantothenic acid.

Vitamin D.—This, the so-called sunshine vitamin, is essential for proper bone development and tooth formation. It apparently aids in the absorption of calcium and phosphorus from the intestine. In young animals a lack of vitamin D results in rickets, which is characterized by swollen joints, soft crooked bones and sometimes by convulsions. Animals need never suffer from this deficiency if they are exposed to adequate sunshine. However, in many cases this is not possible under today's mass-production methods. It then becomes necessary to supply it in the ration by means of fish oil, certain irradiated products (not effective for poultry) or the new D-activated animal sterols. Very little vitamin D is contained in natural feedstuffs, although sun-cured alfalfa meal may carry small amounts.

Other Vitamins.—A number of other factors have been studied, but their functions and the requirements of common farm animals for them have not been determined exactly. Among these vitamins may be mentioned vitamin E, vitamin K, biotin, choline, and inositol. This is not a complete list, but gives an idea of the complexity of the subject. Ordinarily, if the vitamins A and D, and riboflavin, are supplied in adequate amounts by a good mixed ration, there need be no fear of a deficiency of any of the other vitamins.

(*To be continued*)

The dairy industry is asking that dry skimmilk be known as dry milk solids or defatted milk solids because of a wrong belief that skimmilk has little food value. —*S. N. L.*

Studies made at the South Carolina Experiment Station have revealed that flour made from the Puerto Rico sweet potato does not spoil under usual storage conditions and that cull potatoes can be utilized to produce this product which is palatable to livestock and high in pro-vitamin A. When sweet-potato flour was added to a low vitamin A ration fed to cows there was an increase of vitamin A and carotene content in the milk. This discovery should interest farmers in Southern states where the soil is more adaptable for raising sweet potatoes than corn.

When Alfalfa Leaf Meal Is Hard to Get

To get around the alfalfa leaf-meal shortage, Kansas State College has recommended the purchase and grinding of late cuttings of bright-green, sun-cured alfalfa hay. Meal of this kind is a good source of Vitamin A and riboflavin.

The college has a "short grass" program which at certain times of the year should help the poultryman to get around any leaf-meal shortages. Finely chopped, short, tender grass when fed liberally each day can be substituted for alfalfa leaf-meal. This grass provides protein, minerals, and most of the vitamins.

A practical program is:—begin in the spring by feeding green oats as soon as high enough to cut and before it joints, follow the oats with Sudan Grass during the summer, and for early fall provide wheat, rye, or oats grass. It is advisable to cut and feed the grass daily even though the birds have green pastures to range over, as the meadow grass soon becomes too tough to be relished.—*Successful Farming.*

Clinical Observations on Swine Erysipelas in Illinois

SWINE erysipelas, a peculiar and oftentimes baffling disease, apparently has existed in Illinois for a long period but only within the past few years has it assumed major importance to the swine industry of this state. The clinical manifestations of this disease are not always the same and the Illinois practitioner may derive little benefit from a study of the literature on swine erysipelas in Europe or even outbreaks in Nebraska, South Dakota and Iowa. There is evidence that the disease is becoming more virulent in this section and that it may become a serious problem in eastern swine producing areas.

There is little doubt that when herd outbreaks of swine erysipelas were rare in this state it was sometimes wrongly diagnosed as hog-cholera, salmonella-cholerasuis, arthritis, calcium and phosphorus deficiency, pig anemia, pig pneumonia, etc.

The differential diagnosis of swine erysipelas is very important from the practitioner's viewpoint. The experienced practitioner will never relax his respect for hog-cholera nor, if alert, will he dally in the diagnosis of swine erysipelas. If symptoms and necropsies leave him undecided, a liberal dose of erysipelas antiserum given to two or more of the affected animals will aid materially in the diagnosis, within 18 to 24 hours.

If marked improvement occurs in the sick animals it is pretty good evidence that the disease is erysipelas.

Some practitioners are inclined to rely too much upon laboratory findings. Laboratory confirmation of the clinical diagnosis is always desirable but a negative report should not justify the reversal of a positive diagnosis.

In one case in my own experience where the history and the symptoms indicated swine erysipelas the specimens, in succession, were reported negative, but the fourth was positive and confirmed the clinical diagnosis of swine erysipelas.

In my section swine erysipelas attacks hogs of all ages but is most fatal in pigs from one day to six weeks of age. In these young animals the morbidity may reach 80% and the case mortality 50%. In pigs weighing 100 pounds or more the disease runs an irregular and unchartered course. Many times the owner has not observed anything wrong in his herd until some morning he finds one to three dead hogs, and there may not be any others visibly sick; or again there may be one or more sick ones. Only occasionally is an outbreak initiated in these larger animals with the clinical picture described in the literature on swine erysipelas.

If, on necropsy, the lymphatic glands are found to be greatly enlarged and free from petechia and there is also an accumulation of serous exudate in the sublumbar region, one is justified in suspecting swine erysipelas and administering a test dose of serum. If, on the contrary, petechia is present generally in the lymph glands, erysipelas may be eliminated, as a rule.

Since swine erysipelas infection is soil borne and since the protection afforded by the antiserum is of only about 21 days' duration the serum alone is of little value as a means of control of the disease unless the animals are ready for market or they can be moved to entirely new quarters for an indefinite period. Also since the disease is soil borne, good sanitation lessens but does not entirely prevent losses. On definitely infected farms the culture-antiserum method of control should be employed. In areas where the disease is very prevalent it is necessary to immunize some herds at one to four weeks of age and on some farms at one to five days of age to prevent the loss of pigs. Entirely different equipment must be used from that used in vaccinating against hog-cholera. It is very important to ascertain the herd and farm history as to hog-cholera outbreaks. This information may save the owner a herd of hogs and the veterinarian much embarrassment.

*From a report of the special committee of the Illinois Veterinary Medical Association on Swine Erysipelas; C. R. Collins, Dixon, Illinois, Chairman.

The Presence of the Lancet Fluke, Dicrocoelium dendriticum (Rudolphi, 1918) in Cattle in the United States.

By EMMETT W. PRICE*
Washington, D. C.

Introduction

ALTHOUGH Leidy (1856) noted that the small liver fluke or lancet fluke, *Dicrocoelium dendriticum* (syn. *D. lanceatum*), is "Stated to be frequent in the sheep of several of the Western States," there has been no authentic record of its occurrence in the United States until Price and Kinchelow (1941) reported that eight cases had been found in the course of Federal postmortem inspection of cattle from the State of New York. The only other report of this parasite from North America was that of Conklin and Baker (1930) who recorded finding it in sheep in Canada, the infested animals having originated in Nova Scotia.

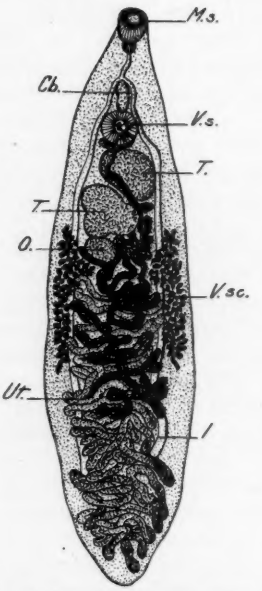
The purpose of the present paper is to present such data as are available on the cases previously recorded from this country and to report additional cases, as well as to review briefly the facts relative to the life history and importance of *D. dendriticum*.

In reporting these cases, a great deal of the credit should go to W. D. Kinchelow and S. R. Roberts, junior veterinarians of the Meat Inspection Division, formerly of this Bureau, for their alertness in detecting the infestations, and to L. V. Hardy and S. K. Nelson, inspectors in charge, Newark, N. J., and Cortland, N. Y., respectively, for securing information on the origin of the cattle in question.

Report of Cases

Up to the present time our records show that 21 cattle have been detected at slaughter to be parasitized with *D. dendriticum*. The available data are given in Table 1.[1]

Except for cow No. 13, which came from Pennsylvania, all of the infested animals appear to have originated in the eastern Finger Lakes region of New York. No information has been obtained as to whether the case from Choconut, Pa., was an animal raised in that region or came from elsewhere. Attempts to secure information from the original owners have been unsuccessful except in the case of animal No. 3. The original owner stated that he had raised this cow and that she had not been on land other than that owned by him. He further stated that he had not at any time introduced into his herd any imported animals. These facts show conclusively that the parasite has been established in New York for a number of years. Owing to the fact that in the past extensive importations of dairy cattle have been made into



Dicrocoelium dendriticum. Ventral view. Enlarged. From Stephens, in Stephens, Fantham and Theobald, 1916 (The Animal Parasites of Man). *Cb.*, cirrus pouch; *I.*, intestine; *M.s.*, oral sucker; *O.*, ovary; *T.*, testis; *Ut.*, uterus; *V.s.*, acetabulum; *V.sc.*, Vitellaria.

*Zoological Division, Bureau of Animal Industry, U. S. Department of Agriculture.

[1] Records of four additional cases have been received since the table was made and the article sent for publication.

New York, where the lancet fluke appears to be more or less enzootic, it is not surprising that this parasite should have become established in the United States, as the evidence now shows that it has. Just how extensively it has become distributed is not known, but it is likely that it occurs more widely than the available data indicate.

Description of the Lancet Fluke

Dicrocoelium dendriticum is lancet-shaped

TABLE I—DATA ON CATTLE IN THE UNITED STATES FOUND INFESTED WITH *D. dendriticum*

Case No.	Sex	Age (Years)	Origin	Where Slaughtered	Date	Discovered by
1	Female	5	Homer, Cortland Co., N. Y.[1]	Newark, N. J.	2/20/40	W. D. Kinchelow
2	Female	10	"	"	2/20/40	"
3	Female	6	Locke, Cayuga Co., N. Y.	"	4/2/41	"
4	Female	8	Tully, Onondaga Co., N. Y.	"	4/2/41	"
5	Male	5	Preble, Cortland Co., N. Y.	"	5/6/41	S. R. Roberts
6	Male	3½	Syracuse, Onondaga Co., N. Y.[1]	"	5/9/41	"
7	Male	4½	Homer, Cortland Co., N. Y.[1]	"	5/21/41	"
8	Male	2	" [2]	"	5/28/41	"
9	Female	5	[2]	"	6/4/41	"
10	Female	5	Oxford, Chenango Co., N. Y.[1]	"	6/6/41	"
11	Female	8	[2]	"	7/3/41	W. D. Kinchelow
12	Female	5	Newport, Herkimer Co., N. Y.[1]	"	9/5/41	S. R. Roberts
13	Female	..	Choconut, Susquehanna Co., Pa.	Cortland, N. Y.	11/5/42	S. K. Nelson
14	Female	..	Delphi Falls, Madison Co., N. Y.[1]	"	10/6/42	"
15	Female	..	"	"	10/16/42	"
16	Female	..	"	"	11/6/42	"
17	Female	..	"	"	11/10/42	"
18	Female	..	"	"	11/18/42	"
19	Female	..	Truxton, Cortland Co., N. Y.[1]	"	11/27/42	"
20	Female	8	? ? ?, N. Y.[3]	Newark, N. J.	11/30/42	L. V. Hardy
21	Female	..	Cortland, Cortland Co., N. Y.	Cortland, N. Y.	12/3/42	S. K. Nelson

[1] From dealers; original owner not located.
[2] Not traceable beyond stockyards.
[3] Originally from New York, county not ascertained.

semi-transparent, and from 4 to 12mm (one-sixth to one-half inch) in length. The male and female reproductive organs are located for the most part in the anterior third of the body, the testes being in front of the ovary. The uterus is long and thrown into numerous loops, and located in the post-ovarial region. The yolk glands or vitellaria are in the equatorial region and lateral to the intestinal ceca. The eggs are numerous, 38 to 45 microns long by 20 to 30 microns wide, and each contains a miracidium or ciliated larva at the time of deposition.

Life History

The life history of the lancet fluke involves terrestrial snails as intermediate hosts. The facts concerning the life cycle and mode of transmission were determined largely by Nöller (1929), Vogel (1929), Cameron (1931), Mattes (1933, 1936), and Neuhaus (1936, 1938), and are briefly as follows:

Nöller found in areas in Germany, where sheep were heavily infested with *D. dendriticum*, that the snail *Zebrina detrita* was parasitized with a larval fluke which he regarded as *Cercaria vitrina* von Linstow, and that another land snail, *Torquilla frumentum*, harbored the same species of cercaria. Nöller appeared to have succeeded in infecting specimens of *Zebrina* by feeding to them eggs of the lancet fluke, but as four of 228 controls harbored the same cercaria his results were more suggestive than conclusive. Vogel found *Cercaria vitrina* in 10 to 20% of the snails *Helicella candidula* and *Zebrina detrita* in an area in Germany where every sheep was parasitized with *D. dendriticum*, and concluded on the basis of epizootiological evidence that these snails were the intermediate hosts of the parasite in question. Cameron in Scotland succeeded in infecting specimens of *Helicella italia* (syn. *H. ericetorum*) by feeding to them eggs of the parasite. The bodies of the snails from which he removed some of the cercariae were fed to two sheep in June and July, and toward the end of November eggs of Dicrocoelium appeared in the feces of one of the sheep. Cameron concluded from this experiment that *Cercaria vitrina* was the larval stage of *D. dendriticum* and that the mode of infection of sheep was by swallowing the infected snails.

The details of the development within the snail and the mode of infection of livestock were worked out by Mattes and Neuhaus. Mattes successfully infected *Helicella ericetorum*, *H. candidula*, and *Zebrina detrita* and observed that the eggs of the fluke hatched in the small intestine of the

snails. The miracidia liberated from the eggs penetrated the intestine and migrated to the interlobular connective tissue of the middle digestive gland, where they developed into mother sporocysts. The mother sporocysts were rounded or irregularly-shaped bodies and gave rise to a generation of simple, tubular sporocysts, each provided at its anterior end with a birth canal. Longtailed, stylet cercariae were developed within this generation of sporocysts. Continuing these observations, Neuhaus observed that the cercariae left the bodies of their hosts in rainy weather following a long, dry period, accumulated in the mantle cavity of the snail in groups of 200 to 400, and became cemented together by secretions from their large glands. In the mantle cavity 5 to 15 of these cercarial masses or slime balls became adhered in a grapelike mass which was covered with mucus secreted by the snail. As the snails migrated these masses of encysted cercariae were deposited on plants or other objects and were taken into the digestive tract of suitable hosts, such as sheep and cattle, while grazing. Upon reaching the intestine the slime balls became digested and the young flukes liberated. The young flukes reached the liver in five to eight days and in about seven weeks attained adult size, eggs being produced about four weeks later.

Nothing is known of the snail intermediate hosts of the lancet fluke in this country. No representatives of the genera serving as intermediate hosts of this fluke in Europe are known to occur in the area where the cases reported in this paper originated. However, several genera of land snails occur in New York and elsewhere and some of these will no doubt be found to be suitable vectors.

Importance of the Parasite

As far as known the lancet fluke is of little importance as a parasite of cattle. Even though this fluke occurs in the bile ducts as in the case of *Fasciola hepatica*, little tissue reaction results. In some cases, especially where the infestation is heavy, slight hypertrophy of the bile ducts occurs and there may be a mild cirrhosis of the liver parenchyma.

Control Measures

The fact that land snails serve as intermediate hosts of this fluke makes control measures difficult and impractical as these would involve chemical treatment of entire pastures. Any satisfactory means of control or eradication would, therefore, appear to lie in medicinal treatment of the infested animals. So far no drug has been discovered that will with certainty destroy the flukes in the liver.

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Sulfaguanidine used in experimental infections of bovine coccidiosis gave favorable results in *Eimeria bovis* when one gram per kilogram of body weight was given for three weeks beginning two days after inoculation, reports D. C. Boughton of the U. S. Department of Agriculture.

Necrophorus Infection in Cattle

Necrotic Hepatitis

NECROPHORUS infection of the liver in cattle is of two types, subclinical and clinical. Both types are common among range cattle and the former, as revealed by post-mortem records, is common among range feeder cattle in Mountain States and Corn-Belt feed lots. The predisposing cause of the infection is unknown, although a small amount of research has been given to the subject. Many practitioners in the Mountain States are convinced the infection is contracted on the range since the lesions found at necropsy, even on animals that have just reached the feed lots, are always far advanced, i.e., the abscesses in the liver, always the most prominent lesion, are of several weeks' or months' development at the time the animals leave the range. A filterable virus may be a primary factor and *Actinomyces necrophorus* acting as a secondary invader.

Some have expressed the opinion that necrotic hepatitis is due, primarily, to feeding by-products of the sugar beet industry to the animals. The opinion seems to be based on nothing more substantial than the facts that the incidence of this ailment is highest in Colorado, where more beet tops and beet pulp are fed than in any other state and the correlative facts that California ranks second in both necrotic hepatitis of cattle and beet top and pulp feedings. The hypothesis fails to explain a prevalence of the disease nearly as great in other sections where beet products are not fed at all.

Others have attributed liver abscesses in cattle to traumatic injury from ingested foreign bodies. The weakness of that reasoning lies in the circumstance that traumatic injury from foreign bodies is many times more common in dairy cattle than in beef cattle while just the opposite is true of liver abscesses. They are many times as prevalent in beef cattle as they are in dairy cattle.

The theory that necrotic hepatitis is primarily due to a vitamin A deficiency has better support than the theory of traumatic or beet pulp causation. The range is often devoid of green forage for long periods, particularly in drouth years. Under such conditions there must be practically no vitamin A in the feed consumed by range cattle.

The disease is of large economic importance. Its etiology merits some well directed research.

■ As previously stated, the subclincal type of necrotic hepatitis is recognized ordinarily only when the animals are slaughtered. They do well on the range and fatten readily in the feed lot, yet when slaughtered a major portion of these livers are destroyed by abscesses, some of them of huge size. Liver condemnations represent a loss of hundreds of thousands of dollars and is increasing year by year. This is causing great concern in the meat packing industry.

■ The clinical type of necrotic hepatitis is a peracute infection with a definite syndrome and practically a 100% mortality. It occurs chiefly in the first two or three weeks after the cattle go into the feed lot, from about November 1st till Christmas time and in the last few weeks of the feeding period or from about April 15th to June 15th; just as the animals are about finished for the market. Fortunately the clinical type of this disease is far less common than the subclinical type. Were this not the case we might be losing anywhere from 10% to 30% of our feeder cattle.

The onset is sudden. An animal may appear well one day and have a temperature of 106 to 108° F. the next morning. Marked depression, refusal of feed, arched back, slight jaundice, cocked fetlock, swaying when walking, a pronounced grunt and feces consisting, in the main, of white mucus make up the clinical picture. Very few animals live longer than 48 hours after the onset of clinical symptoms.

To date no treatment has been of any value. Even the sulfa drugs, which are remarkably effective in another necrophorus

*Excerpted from an address of James Farguharson, Fort Collins, Colorado, at the 38th annual meeting of the Kansas Veterinary Medical Association and published in the annual report of the association.

infection—calf diphtheria—are useless in necrotic hepatitis. The course is too rapid. The disease appears to be essentially a septicemia.

Calf Diphtheria

Another *A. necrophorus* infection of cattle, very prevalent in Montana, Wyoming, New Mexico and Colorado, is known as calf diphtheria, which is something of a misnomer because it is occasionally seen in suckling calves but occurs frequently in young feeder stock six months of age or older—even up to two years. The etiology of calf diphtheria like some other necrophorus infections may not be fully known. However, when the lesions are developed we find the necrophorus organisms present in large numbers. A variant of this disease or a related ailment is seen in young dairy calves in which only mouth lesions prevail. In the more severe cases, in somewhat older animals, both mouth and laryngeal lesions occur.

The onset is characterized by marked dyspnea, heavy, rapid breathing, which can be heard at a considerable distance, a temperature of 104 to 106° F. and great depression typical of acute toxemia or septicemia. I think the depression and death, when death occurs, is due to a septicemia or bacteremia although most writers have referred to it as toxemia. In two instances, in which a search was made, we demonstrated the organisms in the blood stream. Another evidence is the remarkable effectiveness of the sulfa drugs. They could hardly be effective against a toxemia.

Until the advent of the sulfonamides no treatment of calf diphtheria was of any value. In some cases the lesions, which consist of ulcers covered by a tough diphtheretic membrane, were removed surgically. The condition simply spread from the wound. In other cases the ulcers were curetted and cauterized. Every bruise started a new ulcer. In a few instances a trachea tube was inserted. Necrophorus infection started up in the wound and killed the calf. Intravenous injections of various and sundry antiseptics were tried with no results. The mild cases recovered spontaneously and the severe ones died.

About four years ago we reported the treatment of eight cases with sulfanilamide intravenously. The result was hopeful but not particularly satisfactory. When sulfapyridine was presented to the profession, we changed to the use of sulfapyridine sodium and gave, intravenously, a daily dose of 3gm per hundred pounds of body weight. This dose builds up in the blood a concentration of 4.5 to 7.0mg per 100cc.

The use of this drug was reported also,

Calf diphtheria occurs more frequently in young feeder stock than in suckling calves

in eight cases. The results were dramatic. The temperature returned to normal in 12 to 16 hours. The dyspnea disappeared in 24 to 36 hours, by which time the calf was eating well, and continued to thrive.

However, the treatment constituted a lot of work. These animals are wild and must be driven into a chute, the most valuable apparatus in the feed yard, and the excitement is bad for them. So the plan was adopted of giving the initial dose intravenously and continuing the administration per os.

Recently because of its lower cost we have been using sodium sulfathiazole. The end results are just as good as with sulfapyridine except that relapses are more frequent along about the fourth to the eighth day and complete recovery requires nine days instead of five as with sulfapyridine. It is a question whether or not the better results obtained from sulfapyridine is worth the difference in increase in cost over the price of sulfathiazole. Altogether more than 100 cases have been treated successfully.

Mastitis in Sheep and Goats a Pasteurellosis*

By H. C. SMITH** and E. E. HARNDEN**
Stillwater, Oklahoma

IN OKLAHOMA the lambing season occurs during February and March. The Oklahoma A. and M. College maintains approximately 300 breeding sheep to supply foundation stock for sale to sheep raisers of the state and for classroom study by the students attending the college. The breeds comprise Southdown, Hampshire, Rambouillet and Shropshire sheep and Angora goats. Following lambing a few of these animals develop mastitis (blue bag). In the larger percentage of cases only one-half of the udder is involved, in some cases the entire udder is affected.

The disease occurs from one week to three months following lambing.

Review of the Literature

Marsh[1] isolated a pasteurella type of organism from cases of mastitis in ewes, commonly called "blue bag" by sheep owners. The condition occurred in approximately 5% of the band; some of the sheep died as a result of the infection. Permanently "spoiled bags" often resulted in animals that survived. The affected sheep were treated by intravenous injections of 50cc of a 1% solution of acriflavine. This treatment proved ineffective.

Sissoko[2] described a strain of Pasteurella isolated from an edematous tumor under the throat, such as occurs in bovine pasteurellosis in India, and summarized the biochemical reactions of the strain on various media. He also gave an account of its pathogenic effects on sheep, goats and calves as well as swine.

Biester,[3] *et al,* isolated a Pasteurella organism from the brain of sheep. The affected animals succumbed after manifesting symptoms referable to the central nervous system. Organisms recovered from the brain tissue following death in the sheep, were fatal to rabbits when inoculated subdurally. When the cultures were held at room temperature for several days they evidently lost their pathogenicity, because when inoculated intraperitoneally into rabbits, the animals did not die.

Fenstermacher,[4] *et al,* report that in an outbreak of disease characterized by muscular incoordination, 200 of a flock of 3500 turkeys died in one month. From the cerebellum of three birds examined a small, non-motile, non hemolytic bipolar staining organism, considered from its characters to be an atypical Pasteurella, was isolated. It was pathogenic to rabbits by the intracranial and intravenous routes and to Swiss mice by the intracranial route. In turkeys, inconsistent results were obtained, seven of 20 birds being killed by intracranial inoculation, and two of five by intravenous inoculation. The relationship of the organism to the disease in the turkeys was not determined.

Symptoms

The disease is manifested in the early stages by high temperatures, loss of appetite, and reddening of the involved udder. The gland becomes swollen, is hot, and

The mother resents nursing by the young lamb

when handled is painful. The mother resents nursing by the young. In case of twin lambs or kids, one of them begins to bleat because of insufficient food. Should the young nurse from the infected udder, scour-

*Published by permission of the Director of the Oklahoma Agricultural Experiment Station.
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ing is not uncommon, often resulting in death. If the entire udder is involved, both offspring usually die, unless placed on another nursing mother. In cases of the disease that occurs two or three months after lambing, butting or bruising during nursing is thought to result in infection. Should the infection spread rapidly, the udder becomes blue in color (blue bag). The secretion consists of a watery, flocculent fluid, later becoming more viscid and yellow. One attack destroys the function of the udder and results in permanent enlargement of the organ.

Method of Obtaining Material

As soon as the herdsman noticed the animal refuse its feed and prevent the young from nursing, we were called and examined the animal closely. Material was obtained from the affected gland after first cleaning it with soap and hot water, then drying it with paper towels. The end of the teats were disinfected with zepheran and allowed to dry. The secretion was then milked from the gland by hand into sterile test tubes with rubber stoppers, and taken to the laboratory. We were unable to isolate the organism from this secretion, and were successful in recovering the Pasteurella organism only from the incised udder.

Cultures

Cultures from the incision were made by streaking blood agar plates, meat-infusion agar plates and pig liver infusion agar plates. There was fair growth on the blood agar and meat infusion agar, but no growth on the pig liver agar.

Two types of colonies were found. One, the predominant, was a small raised glistening colony which when stained was found to be a short rod. The other, a little larger and more milky in appearance, proved on staining to be a mucoid coccus. The rod was isolated and more culture characteristics were determined as follows:

Short gram-negative rod showing bipolar staining when counter stained with dilute fuchsin or saphrinin.

It grew well on meat infusion agar, producing small, round, raised, glistening, slightly opalescent colonies. On meat infusion broth only slight turbility. No hemolysis.

On litmus milk there was no acid or coagulation within 72 hours.

Gelatin was not liquefied.

H_2S (hydrogen sulphide) was produced.

Sugar fermentations were as follows: No gas in any carbohydrate tested. Acid was produced in sucrose, dextrose, and mannitol. No acid in lactose and dextrin.

This organism falls in the classification described by Rosenbusch and Merchant as *Pasteurella multocida.*

Old cultures were not pathogenic to young rabbits inoculated intraperitoneally. Fresh cultures produced death in rabbits when inoculated intraperitoneally.

Treatment

For several years the college herdsman had been advised, in cases of blue bag, to use hot applications to the affected udder. This proved tiresome and impractical and the results were not satisfactory. The sheep raised at the college are all pure-bred and considered valuable as breeding stock. It was thought advisable to conduct some experiments in an effort to find some method of saving the lives of these sheep.

Permanent enlargement of the udder a result of mastitis in a ewe

Autogenous bacterins were prepared, using the organism recovered from the infected glandular tissue. The Pasteurella organism was grown on meat infusion agar for 48 hours in the incubator at 37° C. The culture was washed with physiological saline solution and adjusted to a nephalometer reading of No. 4. The virulence of the

organism was destroyed by the addition of 0.4% formalin and incubation for 24 hours at 37° C. Sterility tests were made in accordance with the outline of the U. S. Public Health Service.

Use of the Bacterin

Infected sheep and goats were inoculated with 2.5cc of this bacterin as soon as the herdsman noticed that the animals were ailing. Seven days later a 5cc dose of the bacterin was given and seven days later 7.5cc. All injections were made subcutaneously under aseptic conditions. No reactions to the injection, either systemic or local, were observed in any of the animals.

Response

About five days following the injection of the bacterin, the affected glands began to decrease in size and become less painful. In approximately two weeks the skin covering the infected portion of the udder had returned to normal. The size of the glands did not return to normal, and there was no function of them even after the next pregnancy. No deaths have occurred in any of the treated animals but 50% of the untreated controls died.

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Acknowledgement is given Alex McKenzie, college herdsman, for his valuable coöperation.

The American Victory at Pearl Harbor

On that Sunday every living soul in the United States knew about the attack on Pearl Harbor, could guess the terrible havoc and death coming from the skies. But it wasn't until months later that the news of a great American victory at Pearl Harbor was released. It was called the victory of sulfanilamide.

In Army hospitals the doctors saw badly wounded men who looked and felt well. They were "amazed" at what they saw. Men who by all past standards should have died were recovering, eager to get back in the fight. There was absence of pus in the men's wounds, mildness of post-operative reactions, and swift, clean healing of wounds.

Sulfa drugs plus good organization that gave the wounded prompt attention performed this wonder.

Wounds were first debrided, every bit of dead or dying flesh that could give food for germs was cut away. Then sulfanilamide was dusted into the wounds, 68 grams, more than two ounces, at a time. Then each man was given sulfathiazole by mouth, as a further aid in stopping invading germs before they could do any damage. That morning when the first alarm sounded, 14 pounds of sulfa drugs were brought up from the basement of Tripler hospital, in readiness for the doctors.

Even among the men whose wounds had been contaminated with the fertilizer-dirty soil of Hickam and Wheeler fields, and who had not had their wounds cleaned out by debridement for 24 hours, not a single massive infection was found 10 days later.

Infection, which in World War I killed 80% of the men with abdominal wounds alone, hardly occurred in Hawaii. Compound fractures of bones and injury of the flesh, for instance, showed that less than 4% of such injuries became infected.

Not a single loss of arm or leg was necessary because of infection.

Since Pearl Marbor, and the knowledge gained there in the treating of battle casualties, the sulfa drugs have grown in stature as one of America's prime war weapons. —F. D. Smith in *Monsanto Magazine*.

The Status of **Hydrogen Peroxide** as an Anthelmintic in Dogs

By FRANK D. ENZIE*
Washington, D. C.

AN article[6] in the 1942 Yearbook of Agriculture made reference to a paper by Whitney in which the latter recommended hydrogen peroxide as a general anthelmintic in dogs. By referring to this article various newspapers and other publications aroused considerable interest among dog owners in hydrogen peroxide as a treatment for the removal of parasites from dogs. In consequence, numerous inquiries have been received by the Department of Agriculture for information concerning all aspects of the treatment. This circumstance prompted a review of the literature pertaining to the use of this drug as an anthelmintic and made it desirable to conduct a limited number of critical tests on dogs treated according to the technic devised by Whitney.

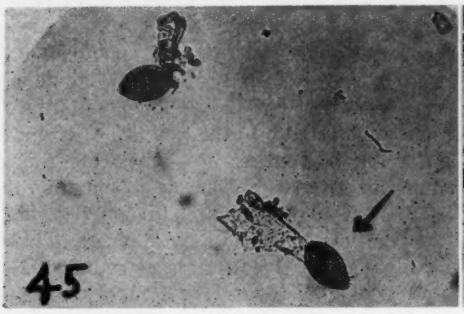


Fig. 45. Eggs of *Trichuris vulpis*, the whipworm of the dog. x100. This parasite occurs in cecum of the dog and fox, and the worms are 45-75mm long

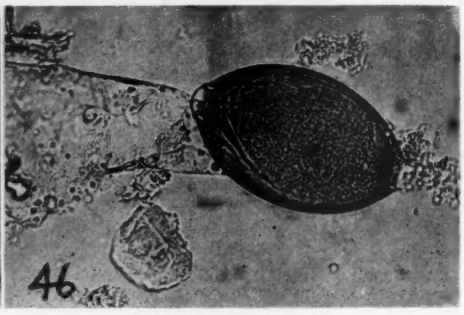


Fig. 46. Same as Fig. 45. x400

Butz and LaLande[2] in 1934 reported that dilute solutions of hydrogen peroxide were very toxic to *Ascaris lumbricoides* in vitro. Three years later, Schwartz and Porter[7] published the first report on the usefulness of this compound as an anthelmintic. A 1.5% solution, administered *via* stomach tube to dogs after a fasting period of 18 to 24 hours, removed 87% of 286 ascarids, *Toxocara canis* and *Toxascaris leonina*, from nine dogs, 22.6% of 75 hookworms, *Ancylostoma caninum*, from eight dogs, but none of 12 tapeworms, *Dipylidium caninum*, from one dog. The only symptom of toxicity in the dogs was vomition, and this was observed in all dogs treated. At necropsy, the only lesion noted was slight gastric congestion in three of the nine dogs. Schwartz and Porter reported their scientific data without, however, recommending hydrogen peroxide as a treatment.

In September, 1939, Whitney[8] reported that a 1.5% solution was effective against all internal parasites of dogs. After a fasting period of 2 to 36 hours, the solution was administered by rectal injection, after a few ounces had been given by stomach tube to expedite vomition. The solution was administered under slight pressure and the injection was continued until vomition was induced. Although impressive data were offered in support of the treatment, a critical analysis by the author of this paper disclosed unwarranted optimism in their interpretation. If only those cases are considered for which critical evidence was presented the value of the treatment as an effective general anthelmintic becomes questionable. Nevertheless, the treatment removed all of 58 ascarids (*T. canis* and *T. leonina*) from eight dogs, all of 144 tapeworms (*D. caninum*) from seven dogs, 73.7% of 564 hookworms (*A. caninum*) from 25

*Bureau of Animal Industry, Agricultural Research Administration, United States Department of Agriculture.

dogs, and 47.8% of 23 whipworms (*Trichuris vulpis*) from seven dogs. However, temporary paralysis of the pelvic limbs, inappetence, hemorrhagic diarrhea and dyspnea were observed in some of the dogs treated.

One month after Whitney's article was published, Magrane and Magrane[5] reported on the administration of hydrogen peroxide drug for the removal of this parasite. Whitney overlooked, however, papers by Harwood, Jerstad, Underwood, and Shaffer[4] in January, 1940, and by Guthrie[3] in July, 1940, in which were reported preliminary observations on the efficacy of n-butyl chloride and of diphenylamine, respectively, as anthelmintics in dogs. The former in-

TABLE I—ANTHELMINTIC EFFICACY OF A 1.5% SOLUTION OF HYDROGEN PEROXIDE AGAINST INTESTINAL WORM PARASITES OF DOGS

Animal No.	Weight (lbs.)	Dose (oz.)	Worms Passed Spontaneously Before Treatment	Worms Removed After Treatment		Worms Found at Necropsy		Efficacy (Percent)	Effect on Host
123	20.5	11	Whipworms 11 (3)[a]	Ascarids	1	Ascarids	0	100	Slight depression.
				Hookworms	16	Hookworms	248	6	
				Whipworms	109	Whipworms	52	67	
124	18.0	10	Whipworms 8 (3)[a]	Ascarids	2	Ascarids	0	100	Marked depression;
				Hookworms	80	Hookworms	1	98	slight inappetence.
				Whipworms	10	Whipworms	11	47	
125	28.5	16	None (3)[a]	Ascarids	1	Ascarids	2	33	Marked depression;
				Hookworms	3	Hookworms	7	30	inappetence; slight
				Whipworms	49	Whipworms	33	59	hemorrhagic diarrhea.
126	45.0	21	None (2)[a]	Whipworms	0	Whipworms	7	0	Transient posterior paralysis; inappetence; hemorrhagic diarrhea.
127	33.0	18	None (2)[a]	Whipworms	7	Whipworms	1	87	Hemorrhagic diarrhea.
				Tapeworms	0	Tapeworms	83	0	

[a] Number of days.

to dogs as recommended by Whitney. Although hookworms and whipworms were removed from the treated animals, the anthelmintic efficacy of this drug was not definitely established because the treated animals were not available for post-mortem examination. This report indicates, however, that apparently the treatment was administered without any untoward results.

In November, 1939, the North American Veterinarian[1] reported in an editorial the experiences of two anonymous practicing veterinarians with the hydrogen peroxide treatment on seven stray dogs. The treatment was entirely effective against light infections in each instance, but all dogs treated with this drug exhibited symptoms of gastroenteritis following medication. Furthermore, three of the dogs became paralyzed during treatment and, at necropsy, severe hemorrhagic gastroenteritis was found in five of the seven dogs.

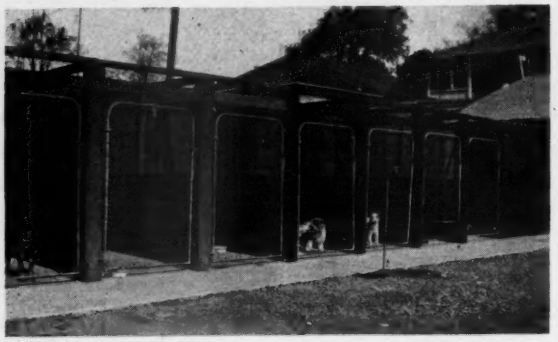
In May, 1942, Whitney[9] published a second paper in which he attributed the undesirable after effects encountered by others to faulty technic. He offered no additional data, however, in support of the treatment, but emphasized its value especially for the removal of whipworms, maintaining that hydrogen peroxide was the most effective vestigators observed that n-butyl chloride, in appropriate dosages, appeared to be about 60% effective for the removal of whipworms. Guthrie reported that doses of 3 to 10 grams of diphenylamine removed 83.6% of 537 whipworms from five dogs without producing any symptoms of intoxication.

In view of the foregoing reports, it is apparent that the value of hydrogen peroxide as an anthelmintic in dogs is problematical in respect to both efficacy and safety. The limited number of additional tests reported in this paper were made in an attempt to clarify further the status of hydrogen peroxide as an anthelmintic in dogs.

Procedure

Since the technic devised by Whitney has been utilized most frequently, every effort was made to follow it precisely. The treatment was given to five dogs of different breeds. Two or three days before treatment, the animals were placed in individual cages. The feces were screened daily in the usual manner in order to detect natural elimination of parasites. The types of parasites in each animal were determined by fecal examination prior to treatment using the salt flotation method. After a fasting

period of 48 hours, each dog was given two ounces of a warm 1.5% solution of hydrogen peroxide by means of a stomach tube and, immediately thereafter, a rectal injection of a similar solution was administered until vomition was induced. The solution was injected under slight pressure, and excess gas was allowed to escape periodically if



the animal exhibited distress. The animals were returned to regular feed four hours after treatment. The feces of each animal were collected individually every 24 hours and examined for parasites in the usual manner. Four days after treatment, the dogs were submitted to necropsy, and the entire intestinal tract was carefully examined for parasites and lesions.

Results and Conclusion

The results obtained from the treatment are shown in Table I. It is apparent that the data with respect to ascarids are relatively insignificant. The other parasites, however, were present in sufficient numbers to allow a reasonably proper evaluation of the treatment. In the aggregate, the treatment removed 67% of 6 ascarids and 28% of 355 hookworms from three dogs, 63% of 279 whipworms from five dogs but none of 83 tapeworms from one dog. The tapeworms, *D. caninum*, were all immature, ranging from 0.5 to 5cm in length. The effect of the treatment on the dogs was variable; slight depression was the only observable symptom in some dogs, whereas inappetence, transient posterior paralysis, and hemorrhagic diarrhea were observed in others. At necropsy, the only significant lesion encountered was a moderate to severe hemorrhagic enteritis in four of the five dogs; the cecum and rectum being most severely affected.

When all available evidence is considered, it is apparent that hydrogen peroxide has received unwarranted publicity as a general anthelmintic in dogs. As stated in the 1942 Yearbook of Agriculture, the treatment was of interest because of its alleged efficacy against several kinds of intestinal parasites of dogs, an attribute possessed by relatively few currently employed anthelmintics. The experiences of others and the results reported in this paper, however, do not confirm the opinion that this is a superior anthelmintic. It appears to lack a satisfactory degree of safety and is not more effective than other anthelmintics that are currently employed for the removal of intestinal helminths from dogs.

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Fluid Balance Mechanism in Health and in Shock*

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LIFE began in an aqueous environment, and all living matter is dependent upon the integrity of a fluid environment. In the course of development the fluid medium of the animal species has become enclosed in a water proof, protective coat of keratin. This augments their sphere of activity, but meanwhile, has burdened them with the maintenance of their body fluids. This aqueous medium contains ions whose concentration must be adjusted with great accuracy for life to continue. If this balance is altered, corrective procedures with water, salts, and blood solutes of small molecular size are necessary to forestall serious consequences. Normally this adjustive mechanism maintains the balance. If it fails an emergency ensues.

Salts and water are indispensable to the organism and are inextricably bound in their interchange between the organism and its environment. This applies to the ions of sodium, potassium, magnesium, chlorine, bicarbonate, phosphate, glucose and protein, all of which contribute largely to the pattern of the intracellular and extracellular fluids.

The first prerequisite for selective fluid distribution is a semi-permeable membrane; in this instance the capillary wall. The proteins which are confined within the capillary circulation have a physiological effect upon the blood volume. These plasma proteins may be separated into two chemical subdivisions which serve separate functions:

1. Albumin makes up approximately 34% of the total protein in horse plasma and 52% of the total protein in dog plasma. Albumin is the more soluble and stable of the plasma proteins. Due to its smaller molecular size and greater osmotic activity it plays a more important role in maintaining the colloidal osmotic pressure of the plasma and retaining the blood volume in the vascular tree than do the globulins. When this osmotic pressure of the plasma proteins is greater than the opposing hydrostatic pressure of the circulating liquids within the capillary bed, fluid from the intercellular tissue spaces enters the circulation. When the opposite is true water leaves the circulation. For it prevents loss of water from the blood to the tissue on the one hand and prevents a too great viscosity of the blood on the other.

2. The globulins are a group of proteins consisting of fibrinogen, prothrombin, antibodies, enzymes and complement. The fibrinogen and prothrombin with the calcium ion and thrombokinase play the important role in the mechanism of blood clotting. It is not clear as to the origin or the amount of complement and antibodies that are found in the blood. However, Dukes (1942) states that Earle found the euglobulin fraction to be deficient and the pseudoglobulin I to be present in only small amounts in foals, kids, lambs and pigs.

Body water is distributed in varying amounts in three fluid compartments of the body:

1. The intracellular fluid, in which the living processes occur, resides in the tissue cells and cells within the circulatory system. This intracellular fluid constitutes approximately 50% of the body weight.

2. The vascular volume (plasma) which makes up the circulatory fluid that is propelled through the vascular tree under pressure maintained by the heart.

3. The interstitial (intercellular) reservoir which surrounds the cells to constitute the internal environment of the organism. It contributes up to 25% of the total body fluids.

The walls of all these compartments are elastic, therefore, the mechanism which controls the volume of fluid in each of them must be delicately balanced. Death can be produced in an animal by altering the water distribution without affecting the total water content of the body. In the normal animal the relative volumes of extravascular and intracellular fluids are maintained

*Reprinted from *Army Veterinary Bulletin*, April, 1943.

in osmotic equilibrium. Except for the protein content, the vascular (plasma) and interstitial fluids are nearly identical chemically. The base in both is principally sodium, and the acid ions are the chloride and bicarbonate. In the intracellular compartment the predominant base is potassium and the acid is HPO_4. Such a discrete apportionment would indicate that the barrier between the interstitial and intracellular compartments must have a selective permeability. The cation sodium is, apparently, the ion that cannot penetrate the cell membrane with the result that sodium is concentrated in the extracellular interstitial fluid. Here the sodium molecules bombard the cell membrane, which they cannot traverse. Some of the water molecules on the extracellular side of the cell membrane have been displaced by sodium. Therefore, there is a greater concentration of water molecules within the cell. The water molecules bombard and cross the cell membrane in both directions. Although passing out of the cell faster than into it, until the hydrostatic pressure within the cell counterbalances the osmotic pressure of the sodium at the extracellular site. At this point the solutions on both sides of the cell membrane have the same concentration of water molecules. Water alone enters the cell only when there is a decrease in the extracellular sodium. Likewise, water will not leave the cell except when there is an increase in such sodium. This suggests that the concentration of sodium in the extracellular fluid governs the amount of cellular hydration.

Normal kidney function maintains an optimum concentration of the extracellular sodium. With an increase in extracellular sodium, water leaves the cell due to concentration gradients which exist between the extracellular and intracellular fluids. Inasmuch as the cell wall is impermeable to sodium, the migration of water between the intracellular and extracellular reservoirs is the only method of establishing isotonicity. Conversely, a fall in extracellular sodium allows for cellular hydration. Therefore, hydration and distribution of body water is kept constant by (1) salt and water intake, (2) the osmotic forces exerted across semipermeable membranes and (3) the regulatory activity of the kidney.

Water from the intestine enters the extracellular fluid first and lowers the sodium concentration there. For a fleeting instant the osmotic pressure of the fluid outside the cells is thus reduced below that within the cells. This allows water to enter the cell and re-establish isotonicity. When the body electrolytes become lowered the kidney removes the excess water and conserves the electrolytes.

Diuresis is a function of decreased tubular resorption rather than increased glomerular filtration. At the arterial end of the capillary bed in the glomeruli the blood pressure and resistance to flow is at the maximum which provide for greater filtration pressure. The blood leaves here at a low venous pressure. In the venous end of the capillary bed about the tubules the oncotic (colloidal osmotic) pressure is high and the hydrostatic pressure is low with the result that water and salts are resorbed as is CO_2. Furthermore, (1) the cells of the tubules concentrate urine to a higher osmotic pressure than that of the blood and (2) specific substances are resorbed. Mention is made in the literature that possibly the posterior pituitary hormone in the blood may control the water resorbing activity of the tubules.

Isotonic sodium chloride seemingly does not alter tubular activity. Due to the cell membrane being impermeable to sodium there is no osmotic gradient set up to permit the passage of water. Therefore, isotonic sodium chloride remains extracellular in its distribution. When sodium salts and water are lost from the body as in diarrhea both the vascular and interstitial fluid reservoirs suffer. The salt and water loss first occurs from the capillaries in the gut. This drains upon the vascular volume and in turn drains water and salts from the interstitial fluid compartment into the circulation. Finally there is an osmotic balance reached between the tissue (cell) fluid and their interstitial fluid environment; then no more interstitial fluid enters the circulation to replenish the water deficit there because there no longer exists an osmotic force to produce such a shift in water distribution. At this point the vascular volume has become rather viscous and the circulation begins to slow down.

Hypertonic sodium chloride solution raises the concentration of the extracellular sodium which can not enter the cell. When water leaves the cells, the extracellular reservoir is increased. For the cells to regain their normal fluid constant, the kidney must excrete an excess of sodium chloride or additional water must be taken in. Diuresis is enhanced by intravenous administration of hypertonic NaCl solution due to: (1) increased blood volume and dilution of serum proteins, (2) increased electrolyte concentration of body fluids, and (3) increased glomerular filtration and lessened tubular resorption.

The total fluids of the body are kept in just the right degree of concentration by automatic controls. The relation between the circulating fluids (blood and lymph) and those in the tissues is also maintained at a fairly constant level. When large losses of fluid occur, as in extensive hemorrhage, profuse sweating, persistent emesis or dysentery, disturbance of the fluid balance becomes serious and may be fatal.

Water loss from the extracellular reservoir is through: (1) evaporation from the cutaneous and pulmonary surfaces and (2) from excretion through the kidney. This increases the concentration of extracellular electrolyte, and through osmosis removes water from the cell. This type of dehydration would deplete the fluid content of all the body compartments if the excess electrolytes were not excreted by the kidney. By this excretion of sodium the kidney conserves cellular water, because less cell fluid has to be withdrawn to maintain osmotic equilibrium.

Perspiration is hypotonic and after profuse sweating the water loss from the body is proportionately greater than the NaCl loss. The fluid distribution in the body is changed, with the extracellular fluid reservoirs (interstitial and vascular) losing water and the concentration of sodium there thus raised. This in turn abstracts water from the intracellular fluid. As a result a generalized dehydration occurs characterized by anhydremia and thirst. During this chain of events both sodium chloride and water are lost from the body. The cells lose less water than the extracellular compartment. On the contrary if sweat were isotonic in composition no osmotic change would occur with this fluid loss, with the result that the cells could contribute no water toward restoring the depleted extracellular reservoir. Therefore, to restore normal fluid distribution, water and salt need only to be administered in the same proportion in which they are lost in sweat. The ingestion of water alone restores the total body fluid volume but in the presence of the sodium deficit in the interstitial spaces, the cells imbibe more water than they originally lost to the extracellular fluid. The result is a cellular edema accompanied by a deficit of water (dehydration) in the extracellular reservoir.

The acid-base balance is disturbed in the loss or redistribution of body water. The extracellular fluid has, as its two chief cations, chloride (Cl) and bicarbonate (HCO_3). The loss of large amounts of chlorine results in alkalosis. The escape of bicarbonate in abnormal amounts results in acidosis. Under these conditions, the normal ionic pattern of the extracellular fluid has to be restored before normal function can continue. In health NaCl is the agent required by the kidney to maintain the composition constant of the body fluids. The bicarbonate ion is derived from tissue oxidation.

The vascular (plasma) compartment or the third fluid compartment, though the smallest, is the most important in many respects. It is (1) the main avenue of exchange for substances that bathe the cells and (2) the outlet for substances which are carried away from them. While performing these functions throughout every portion of the body, it must maintain also its volume and composition. The volume due to its effect on capillary pressure plays a leading role in determining the direction of fluid exchange between the plasma and tissue fluid. This arrangement

is advantageous to the organism, since any alteration of fluid balance by external environment, is first detectable in the vascular compartment.

In the year 1795 a clinical syndrome that had been noted long previously to be a peculiar reaction to surgical, thermal, traumatic and chemical injury was designated as "shock" by James Latta of Edinburgh, Scotland. Veterinarians are frequently confronted with this phenomenon, which we still denominate as shock.

Moon (1942) states that "reciprocal effects of capillary atony and tissue anoxia give the shock mechanisms the self-perpetuating quality of a vicious cycle". Adequate circulation throughout the body depends upon: (1) the condition of the vascular architecture, (2) the efficiency of the propelling force, and (3) the constituents of the circulatory fluids. In the state of health on the arterial side of the circulation, the hydrostatic pressure, the force which tends to drive the fluid out from the circulation into the tissues, is greater than the collodial osmotic pressure, the force which tends to prevent the escape of the fluid through the capillary walls. Therefore, oxygen and osmotically active metabolites are forced out from the intravascular fluid into the extravascular fluids which bathe the tissue cells of the body. Likewise, on the venous side of the circulation, where the hydrostatic pressure is less than the colloidal osmotic pressure, the extracellular fluids containing the end products of metabolism and salts diffuse back into the circulation and are thus transported to the emunctory organs and eliminated from the body. Therefore, the viscosity of the plasma proteins is of utmost importance for the continuation of the circulation; and further by their osmotic pressure they make possible the nutrition and waste interchange between blood and tissues.

The understanding of shock and its cause may be illuminated by clarifying the physiological function and reactions of the capillary endothelium and allied mechanisms, fluid balance, and cell permeability. Individual organs and tissues are endowed with a capillary supply adequate to meet their maximal circulatory needs. It is a known fact that muscles require 20 to 30 times as much blood during activity as they require when at rest. Functioning cells utilize oxygen and liberate end products of metabolism. The lack of oxygen (anoxia) increases the susceptibility of the capillary endothelium to injury and upon the development of anoxia the capillaries relax and become permeable. This relaxation accommodates an increased flow of arterial blood, thus insuring a greater supply of oxygen and other nutrients. The fresh arterial blood contains endocrine substances which contract the dilated capillaries and limit the blood flow, until the oxygen privation or metabolic accumulation again produces relaxation of the capillary endothelium. This cycle is repeated at a rate commensurate with the functional activity of the tissue cells.

Shock is a type of peripheral circulatory failure which causes a profound disturbance in the physiologic mechanism of the body and leads to a syndrome exhibiting, among its manifestations, hemoconcentration, oligemia and a generalized peripheral vasoconstriction.

Circulatory failure may develop from capillary origin, inasmuch as anoxemia, metabolites, products of protein cleavage, foreign protein, histamine, bile and cholic salts, alkaloids and poisons injure and increase the permeability of the endothelium to the extent that there is a leakage of plasma through the capillary wall. This results in (1) an increased flow of lymph with its high protein content, (2) a decline of venous blood pressure, (3) a decrease in plasma volume and (4) hemoconcentration.

The capillary endothelium may also become permeable without damage and allow the plasma to leak through it. Such a condition arises where there is prolonged exercise accompanied by profuse sweating. This depletes the interstitial (tissue space) water to an extent that it cannot supply ade-

quately the tissues with needed fluid and metabolites. Thus the stage is set for one type of shock. Due to this fluid loss and cell autolysis, the osmotic pressure within the tissue cell becomes higher than the hydrostatic and colloidal osmotic pressure within the vascular tree. This unbalance draws the circulatory fluid out of the vascular channels, into the tissue spaces to replace the intercellular fluid that has been used up. Unless fluid and electrolytes are supplied, the osmotic pressure of the tissue space fluid will overbalance the osmotic pressure within the cell and intracellular fluid will be lost into the tissue spaces.

The effects of these reactions tend to create a disparity between the blood volume and the capacity, of the vascular bed. Capillary and venule dilitation increase the capacity, while plasma loss through the vessel wall reduces the blood volume. This inequality impairs the systemic circulation and results in engorgement of the capillaries and venules, petechial hemorrhage caused by endothelial dissolution, stasis in the small vessels of the viscera, edema of the soft tissue and, often, necrosis of parenchymatous organs.

Hemoconcentration is of early significance in disturbed fluid balance. Injury to capillary endothelium permits plasma loss into the tissue spaces. A normal semi-permeable membrane (endothelium) is necessary to the action of capillary blood pressure, osmotic pressure and to hormonal and electrolytic concentrations in maintaining a physiological relationship between intravascular and extravascular fluids. A change from the normal endothelial permeability excites a derangement in the physiological levels and concentrations of blood volume. Hemoconcentration is thus of grave importance, for it suggests a derangement in the vital mechanism of fluid balance.

In shock increased cellular permeability plays a no less significant role than does endothelial permeability. Luke and McCutcheon (1932) showed that each cell behaves as an osmotic unit, in that the outer protoplasmic surface of living cells function as a semi-permeable membrane. Within the living cell of protoplasm maintains chemical concentrations markedly different from those of the external fluids. These normal differences in concentrations are reduced by cell injury and lost when the cell dies. These effects allow the electrolytes to pass from the region of higher concentration to that of the lower. This tends to equalize the differences in composition as illustrated below:

Normal Cells

Cellular Fluid		*Extra Cellular Fluid*
K, Mg, Ca	→	Mg, Ca
HPO_4, SO_4	←	HPO_4, SO_4
Cl, HCO_3	←	Na, Cl, HCO_3

Injured Cells

Cellular Fluid		*Extra Cellular Fluid*
K, Mg, Ca, Na.	⟷	K, Mg, Ca, Na
HPO_4, SO_4	⟷	HPO_4, SO_4
Cl, HCO_3	⟷	Cl, HCO_3

Hemoconcentration precedes the above changes, thus indicating that they are effects rather than causes. The same injurious agents that excite disturbances in the circulation and fluid balance may also contribute to this disturbed electrolyte balance. The type of circulatory failure, often seen after severe traumatic injury, extensive surgery, intestinal strangulation, perforations, severe infections, intestinal manipulations, dehydrations, exhaustion or extensive burns is of peripheral origin. It is characterized by decreased blood volume and decreased flow accompanied by hemoconcentration.

In animal patients, the onset of shock presents the clinical manifestations of profound depression, weakness, doughy, dry skin, anxious expression, eyes sunken in their orbits, shallow, rapid respiration and loss of responsiveness to stimuli and reflexes. Oncoming shock from exhaustion in the horse is ushered in with anorexia, a temperature of 103 to 105° F., which later becomes normal or subnormal and livid, dry, pasty visible mucous membranes. The skin and skeletal muscles are inelastic and doughy in consistency. The pulse at first is full and bounding but small in volume. Later is becomes weak and irregular. The body extremities are cold and the body is often covered with a cold sweat. Anuria, and less often severe diarrhea, is sometimes seen in these cases. This clinical syndrome is accompanied by a typical group of departures from physiologic constants. These are: (1) reduced cardiac output and volume

flow of arterial blood (hemoconcentration), (2) increased capillary permeability, (3) plasma loss, (4) delayed coagulability of the blood, (5) congestion of the abdominal viscera, (6) often dilatation of the right heart, (7) reduced chloride and oxygen content of the tissues (anoxia), (8) increased non-protein nitrogen and potassium content of the blood.

Shock from wounds may be ushered in by cold, delay in debridement, anesthesia, infection, loss of fluid by perspiration and particularly by rough transportation. This phenomena was long known as "traumatic toxemia."

There are certain similarities between shock and hemorrhage. The activities of the sympatho-adrenal system produces: (1) stimulation of the myocardium, (2) peripheral vasoconstriction, (4) reduced blood volume flow, (4) peripheral ischemia, (5) loss of tissue turgor, (6) contraction of the spleen, (7) increased blood sugar and (8) decreased serum protein. In the late stage there is an increased respiratory rate and a declining venous blood pressure, due to inadequate circulatory function.

The pathogenesis of the shock syndrome is a definite sequence of events. One of the chief mechanisms for the maintenance of blood volume is disrupted when the protein has escaped, through the capillary walls, from the confines of the circulatory system. The presence of protein on both sides of the capillary wall, lowers the osmotic gradient referable to protein between the circulatory and interstitial fluid. The effective oncotic pressure of the blood is diminished and the mechanism for the maintenance of the blood volume is impaired. With loss of the plasma from the blood stream the blood becomes viscous, which is another impediment to the circulation. Arterial spasm aggravates further the reduced peripheral blood flow (venus pressure) and tissue anoxia. Therefore, the vascular system attains an abnormally large capacity due to peripheral vasodilation and at the same time contains within its confines an inadequate volume of circulatory blood. The blood pressure falls to a dangerously low level. These events intensify and perpetuate a vicious cycle.

When the foregoing phenomena eventuate, the compensatory mechanisms come into play in an effort to avert a fatal issue. The sympatho-adrenal system pours out its secretion and the heart beats rapidly, however, the force of contraction is poor, due to inadequate venous return. This results in incomplete diastolic filling of the ventricles.

Differences between Shock and Hemorrhage:

Item	*Shock*	*Hemorrhage*
Endothelium	Permeable to colloids	Imperable to colloids
Tissue fluid	Increased	Decreased
Flow of lymph	Increased	Decreased
Fluid balance	Disturbed	Disturbed
Pulmonary edema	Progressive	None
Absorption gastro-intestinal tract	Unimpaired	Unimpaired
Diarrhea	Frequent	Absent
Blood transfusion	Often ineffective	Effective
Saline solutions, intravenous	If hypertonic often effective as borne out by clinical results.	Often effective
Edema	Characteristic	None
Capillo-venous congestion	Characteristic	None
Petechiae	Characteristic	None
Visceral ischemia	Absent	Present
Gastrointestinal tract	Dilated—Atonic	Contracted
Organ weight.	Increased	Decreased

The treatment of shock should be commenced as early as circumstances will permit, so as to limit its severity to a minimum. An anhydremia exists due to the isotonicity of the fluid lost from the circulation with the other body fluids. No osmotic forces are available to promote any fluid shift from the cells to aid the circulation, protein in the interstitial fluid tends to fix fluid at that site. Therefore treatment must be toward maintaining an adequate circulating volume and encouraging a redistribution of fluid back into the circulation. Furthermore, the initial cause of the syndrome must be relieved, time worn remedies such as cardiovascular stimulants and vasoconstrictors are of little value.

Since the pathology of shock is still far from being an open book, the writer feels that if procedures such as the "falling drop" of the blood, as well as hematocrit readings, with fragility tests on the RBC and hemoglobin determinations, were done, invaluable information would be elicited as to the pathological picture that is present in many patients manifesting shock. Fluid intake is of as prime importance as is proper elimination *via* the gastrointestinal tract and kidneys. Drastic purgatives and diuretics are contraindicated. Oxygen therapy has its place if it is at all practical.

Fluid replacement by means of hypertonic intravenous injections and plasma injection are a cornerstone in the treatment of shock incurred from burns, exhaustion, prolonged surgery and in the case of slow-healing, suppurative wounds that entail sepsis. As stated by Davidson (1942) the administration of adrenal cortex extract should be considered in case of shock. Animal experimentation and clinical observations on the effectiveness of adrenal extract, in decreasing capillary permeability and retarding plasma loss, gives this drug an important place in shock treatment. Its value is probably enhanced if it be administered as a prophylactic as well as in the treatment of shock.

There is a theory, known as the "lost plasma" theory, that death results in hemorrhagic shock from reduction in the blood volume by passage of plasma through the capillaries into the tissues. An experimental study of the problem has been made on dogs by Fine and Seligman. However, their evidence does not indicate that death from hemorrhagic shock in dogs is caused by a progressive decline in the blood volume due to the passage of plasma into tissues. The conclusion that plasma loss by passage into the tissues is not a crucial factor seems warranted.—*Jnl. A. M. A.*

The administration of plasma colloid (plasma) in shock is an indispensable factor in the restoration of fluid and electrolyte equilibrium. For field use dried plasma has advantages over the fluid form in that it can be (1) transported easily, (2) undergoes slight risk of contamination, and (3) can be prepared quickly for use by addition of distilled water. Having prepared and administered dried plasma with no untoward results, the writer is convinced of its practicability, availability and usefulness as a therapeutic agent and that it is superior to whole blood in the treatment of shock in animals, except possibly in cases resulting from severe hemorrhage. Plasma, in addition to increasing the blood volume, makes plasma protein available to the tissues. Plasma is also worth a trial in the treatment of some of the infectious diseases, such as influenza, strangles, pneumonia and some of the non-infectious diseases seen in the equidae, namely, purpura in the incipient stage.

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The action of the antirachitic vitamin in the body is directly concerned in the preservation of the mineral balance. Vitamin D not only acts as a regulator of the metabolism of these elements (calcium and phosphorus) but permits the body to operate with greatly increased economy. When it is present in optimum amount, the metabolism of these minerals is maintained in a nearly normal manner, even when one or both of them is supplied at almost starvation levels.—*E. V. McCullom.*

* * * *

Blood Characteristics

Blood is a peculiar fluid, unique in fact. When exposed to the air it solidifies at the point of exposure but remains unchanged elsewhere. Anti-leak mixtures for automobile radiators imitate this phenomenon of the blood but without entire success. Clotting of the blood is due to its prothrombin content and that in turn is partly dependent upon the presence in the blood of vitamin K. Sometimes the prothrombin is deficient in amount and the blood clots slowly. In such cases the clotting power of the blood is improved by giving the animal vitamin K over a period of several days to a month. Administration of vitamins will not hasten the clotting of normal blood.

Autobiography of a Veterinary Practitioner

By E. T. BAKER, Moscow, Idaho

XVII

Specialized Practice

IN these days, there are many types of specialized practices, such as race horse; logging outfits; fur bearing animals; small animal work; zoological practice; poultry work; research and many others.

Not having had any special training along these lines, except two years in small animal work, I do not claim to know much about them. This comes in handy, for, when one pretends to know something he really does not, it is liable to get him in a hole.

I regret the span of life is so short that one cannot learn more. However, I merely try to keep up in my chosen field, that of being a general country practitioner, and caring for routine work that comes along—and a lot of that seems to be obstetrical work. I have never performed a "roaring operation" in my life, because we have no roarers in this country, and very little heaves. All kinds of messy operations, such as trephining, can be referred to a college hospital not many miles distant. Even the few spaying cases can be passed up.

Handling Various Calls

When the 'phone rings, and a client asks me to come out, I usually ask:

"How is it acting?"

He then gives me an insight of what to expect, and while I carry everything needed in ordinary work, this information gives me a chance to be prepared for this call, both in the way of supplies and dress. Years ago, I asked a rather smart client:

"What seems to be the trouble?"

"That's what I'm calling you to find out," he answered.

The next preliminary is to be sure of the client's name, and exact location. When I started in practice I had a lot of trouble in differentiating Hatton from Hadden; Swanson from Swenson, and the various Johnsons, Olsons, Lindquists and other Scandinavian names. However, this is quite simple to me now.

Another important item to keep in mind during bad weather is the condition of the roads off the highways. If the patient happens to be a horse with impaction and can be readily moved, it can be lead over to the highway. In many cases, the client is willing to meet me at the highway, for he has chains on his car. In winter, our car is equipped with ground gripper tires as well as heavy mountain chains, for we have plenty of snow and mud in our section.

I also carry a gallon bottle of warm water; a ten quart aluminum pail, a wash pan, towels and so on. Then, if the patient happens to be out in a field, far from the house, and we can drive over to it through a field, we have all the supplies needed.

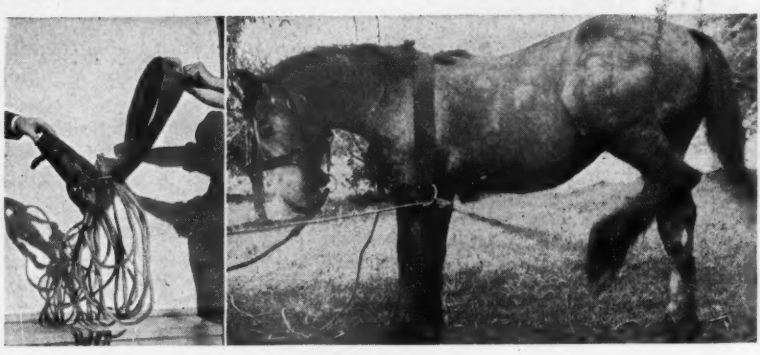
Good and bad luck plays a very important part in building up a practice. Elsewhere we have mentioned how easy it is to make a poor reputation in a new community by losing the first case. Then again, anything can happen while one is making the trip. He can have a flat tire, slide into the ditch, or have a hundred other accidents. He can save or lose the case; be paid on the spot or never receive a penny.

Restraint

Perhaps in no other way is our skill as a practitioner judged than by the way the patient is handled. If one has the knack of dealing gently and quietly with animals, and being able to examine them and make a diagnosis without calling the national

guard in, so much the better. This is the first requisite of success in practice. It may be compared to the "bed side manner" of a physician.

Horses can be handled with a halter, casting harness or lariat. Cows are best examined in a stanchion. Sheep and goats may be held by the owner. Pigs can be crowded in the corner with a panel. Small animals should be held by their owners, and, if necessary, securely restrained on a table.



To the left is shown the author's casting harness with two 20-foot lariats—the back strap is held up and the breast strap is in front. To the right is shown the harness applied and also a large halter in use

Every practitioner is as familiar with this subject as I am, hence nothing more need to be mentioned.

Writing Articles

In writing, know your subject, and be as concise as possible. Do not use a long-winded introduction, and devote several thousand words on what everyone knows.

There is a four-line bit of poetry that covers this subject very well, and it goes as follows:

Beneath this stone lies Murphy,
We buried him today.
He lived the life of Riley,
While Riley was away.

No unnecessary details are given for none are needed. "A word to the wise" still holds good in professional writing, for most of the readers have almost human intelligence, and know what the author is trying to explain.

Suppose you feel the inspiration for an article insidiously creeping up on you, and you decide to send forth an undying essay on "Milk Fever." Biting the end of your pencil you proceed to block out the various sub-heads, such as:

1. Cause
2. Symptoms
3. Treatment

Then, as you contemplate the paper very carefully, you suddenly say to yourself:

"Why take up the cause, when I don't know any more about it than anyone else?"

So, you mark that out.

Next, you say to yourself: "Every practitioner knows the symptoms of milk fever, so why dwell on that?" and that is erased.

Finally, you remember the routine treatment of milk fever is familiar to every experienced practitioner, and out that goes.

You are now exactly where you started from. Your brilliant intellect is now in a total blackout, as the muse of inspiration evades you.

Then, you suddenly think of some bad cases you have had. Only last week you were called to see a big Holstein cow who refused to recover after you had given her everything in your emergency grip. Finally, on the third day, she took up her bed and walked. Then, out at Anderson's, you were called to see a little Jersey cow apparently dead to the world with milk fever before she had even calved. That was a puzzling case, and it kept you guessing, but she finally recovered, after having a normal parturition. That's it! Why not head your

article "Complications of Milk Fever," and take up some of the cases that did not respond to routine treatment?

You slowly tabulate some of the cases you

Doctor Baker practices what he preaches—this is a case of milk fever about which he wrote an article for this magazine several years ago

have observed, such as the following:

1. Delayed cases
2. Digestive complications
3. Obstetrical paralysis
4. Nervous types
5. Pre-parturition cases
6. Uterine eversion
7. Septicemic forms
8. Other atypical cases

You briefly give your observations; line of therapy and final results, using the same, simple, intelligible language you would employ in talking to a fellow practitioner. You do not try to "show off" your scientific knowledge, for your readers quickly make up their minds whether you know "your stuff" or not.

You keep in mind an ordinary letterhead, 8½ by 11, double-spaced, will contain about 300 typewritten words. You are careful about spelling and paragraphing, and, after writing and revising about 1500 to 2000 words, you send it in to the editor of a veterinary journal. If you can furnish several good, glossy snapshots explaining your cases, so much the better.

Your article appears in due time, and what are the reactions of the readers?

Let us suppose Dr. Killam, of Blue Wing, Iowa, sits down in his easy chair, after a trying day, and picks up his journal. Then, he settles back for an hour of relaxation, hoping to pick up a few helpful hints along the way.

He comes to the first leading article entitled: "The Blood Content of the Pregnant Potato Bug." He glances at the long tables of scientific data, giving in tiresome detail the intimate life of the aforesaid beetle.

With an exasperated snort, he rapidly turns to the next article, which happens to be "Nutritional Value of Kaffir Corn." As none of this is raised in his community, he gives it a fleeting glance, and rapidly turns to the next page.

His tired eyes suddenly light up as he spots your article: "Complications of Milk Fever." He starts in reading. Only a few days ago he had a case of milk fever that resisted all kinds of treatment, and is still paralyzed.

As he scans your experiences, observations and lines of treatment, he suddenly pauses:

"By George, maybe that guy knows what he is talking about. I'll try that on the old cow in the morning." He does, and the patient recovers. Perhaps she might have made it without your suggestion, but you receive due credit. He tries other hints with equally good success.

When he renews his subscription, he tells the editor how he likes your practical articles and hopes to see more of them. You begin to receive letters asking more practical discussions, for, in this way is knowledge diffused, and the entire profession gains thereby.

But do not advocate anything you have not tried and re-tested. Give the true results, whether favorable or otherwise. Keep in mind the wide diversity of foods, water and soil, as well as different types of climate and routines of animal husbandry.

Take into consideration all these different factors, much like the negro preacher who was delivering a sermon on the wonders of nature.

"Man and woman were created the same with the exception of a few variations," he thundered.

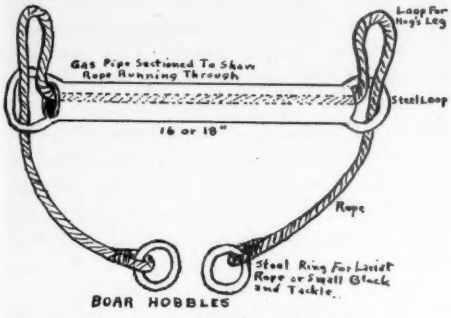
An old deacon, catnapping on the front seat, suddenly awoke and shouted:

"Amen, Brother, and thank God fur them variations!"

(To be continued)

Restraint for Castrating Boars

A method of restraining boars for castration that impressed the writer as being worth reporting is employed by Dr. H. A. Alcorn, Adair, Iowa. With the doctor's apparatus one man can cast and castrate a boar quickly and easily.


Loop For Hog's Leg
Gas Pipe Sectioned To Show Rope Running Through
Steel Loop
16 or 18"
Rope
Steel Ring For Lariat Rope or Small Block and Tackle
BOAR HOBBLES

The hobble is made something like a twitch with a loop at each end. Doctor Alcorn uses a section of 1¼-inch gas pipe 16 inches long with a large steel ring welded onto each end. In use a half-inch rope is passed through the pipe, one end looped around each hind leg and passed back through the ring. For convenience a small ring is fastened to each end of the rope. The two ends are brought together and traction exerted upon them to fix a leg solidly to each end of the pipe.

For the casting there must be two firm structures to which to anchor the ropes. Probably the most dangerous part of the operation is the passing of the loop of rope over the upper jaw of the animal, but that must be done in about any method of restraint of large boars.

A lariat or loop of rope is passed around the upper jaw in the usual way, preferably behind the tusks, and the rope is secured to a post or other solid structure. The hobbles are then placed on the hind legs below the hocks; a rope fastened in the rings; passed around the post or solid structure used, then back through both rings of the hobbles. This forms a simple but effective block and tackle.

When the rope is tightened the boar is stretched out and falls either on his back or side. The legs are spread by the hobbles and the castration can be made well forward where the skin and subcutaneous tissue are thin. This also seems to be the cleanest part of a hog. One or two incisions may be made, whichever the operator prefers. By making the incisions well forward, the scrotum is not damaged, good drainage is established and, as the castration wounds are not noticeable, the stag can be sent to market much earlier.

The steel rings on the ends of the rope may be made smaller than the steel rings on the ends of the tube of the hobbles in order that the loop can be passed around the leg of the boar thus eliminating the lifting of the boar's legs to get them into the hobbles.

BURSON BUSSET.

Manhattan, Kansas.

Hemorrhagic Septicemia of Rabbits

Outbreaks of hemorrhagic septicemia are of common occurrence in hutch-bred rabbits. The disease is contracted, ordinarily, from contaminated food or water, and may occur suddenly in a rabbitry that has been free of the disease for a long period.

The first intimation a breeder may have of the presence of hemorrhagic septicemia among his rabbits is the finding of one or two animals dead in the hutches and several sick in adjoining hutches. The sick rabbits have a lusterless coat, lowered head, watery eyes and a high temperature.

Hemorrhagic areas in the lungs and on the serous coats of the heart, liver, pleura, mesentery and elsewhere are found on necropsy of acute cases.

Treatment. — Contrary to the common opinion held by rabbit growers, this disease is easily controlled. The sick must be segregated and good sanitary practices instituted.

The unaffected animals should be given 1cc of hemorrhagic septicemia bacterin, not necessarily of the lepine strain. The sick also should be injected with the bacterin. If they live for as long as four hours after receiving the bacterin, their chances of recovery are good.

GEO. GORDON

Chicago, Ill.

Cutaneous Habronemiasis

August 17, 1942, while assisting Dr. V. H. Finck of Elizabeth City, North Carolina, I observed the following case:

A four-year-old, molly mule, weighing approximately 1000 pounds was brought to the hospital for treatment. The animal exhibited eight raw sores on its body and legs. These sores ranged in size from one inch in diameter on the legs, up to an area on the right shoulder, approximately 14 inches in diameter. There was a history of a small wire cut on the breast about 60 days previously. No particular treatment had been given the wound. It had failed to heal, and had continued to become larger. The animal persistently rubbed the wound, thus stimulating excessive granulation. About one month after the wound on the breast was received the small sore appeared on the shoulder and continued to spread. Other eruptions of the skin occurred at later periods.

The condition was diagnosed as cutaneous habronemiasis (summer sores). Similar conditions have been described by Monnig in *Veterinary Helminthology* and by E. R. Frank in his *Veterinary Surgery Notes*. This condition is seen rather commonly in this part of the country.

The etiology was explained to the owner as being due to larvae of the *Habronema megastoma*, which are transmitted from horse feces to wounds by flies. A rather unfavorable prognosis was given, especially until cooler weather. The owner insisted the animal be left at the hospital and given treatment.

The treatment consisted of the surgical removal of a mass (weighing 5½ pounds) of exuberant granulation tissue from the breast. Formalin (full strength) was applied to this wound until a firm scab was formed. Slaked lime and various commercial drying antiseptics were applied to the other areas, finally being followed by applications of a 2% formalin solution. Various arsenical preparations were administered internally.

December 13th, approximately four months following the beginning of the treatment, which was three months after the first cool weather, the areas had completely healed and the animal was ready for work.

LOWELL M. WEBB

Beverly, Kansas

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A Day in a West Virginia Practice

The pages right out of the practices of Drs. Baker and Sigler that have appeared so often in VETERINARY MEDICINE have given me so much pleasure as well as information that, in appreciation, I am offering some of my own experiences. The strong appeal that Baker's and Sigler's discussions have for me is due to their naturalness; to the fact that they deal with the ordinary experiences of a man in practice. So I add the record of just an ordinary, not a routine, day. There are no routine days in practice; each case, let alone each day, is unique.

5:00 a.m.: The telephone rings. "Doc, tell me what's wrong with my cat? It hasn't eaten a thing for three days."

"Well, what are some of the symptoms?"

"I don't know. She just sits around and refuses all kinds of food."

"Has there been any bowel movement? Is it a male or a female? Are there any indications of labor?"

"Oh, I don't know. I haven't seen her for three days. She has been gone from home, nobody knows where and just got back. I thought you ought to be able to tell me what is wrong with her."

Well, I did have an idea of what was the matter with the cat and said: "Give her a teaspoonful of castor oil and report tomorrow," and went back to bed. The cat was all right the next day. How do I know? Why, I heard nothing further from the owner.

7:15 a.m.: The 'phone rings again: "Hello, Doc! Tom gave the old cow a 'rench' of linseed oil. Do you think it will do her any good? She has been sick for three or four days."

"What is wrong with her?"

"Lost her cud day before yesterday. The children spent two hours yesterday evening hunting for it."

"Did they find it?"

"No! Where'd yuspose it is?"

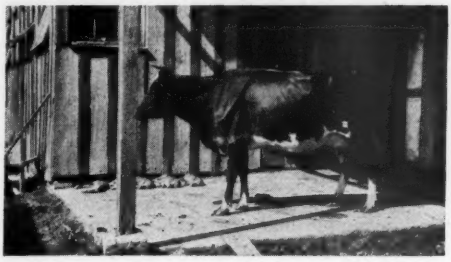
"Who is this?"

"Sam Vinson on 10-mile crick. What are you going to do about my cow?"

"If she isn't dead by tomorrow, call me again."

"All right, Doc."

No report was received. So it seems the



cow succeeded where the children failed.

It is 9:00 a.m. The morning's work at the hospital is well under way but far from completed. The 'phone rings.

"Doc, this is Bill Delaney. Come at once. The grey mare has got the colic. Been sick all night."

"How is she acting now?" But Bill was gone so I made the trip—eight miles north of the city.

The mare was on her back in a ditch, feet in the air. She had been like that, struggling, for six hours. A yoke of cattle was obtained from an adjoining farm and the mare was dragged from the ditch. She couldn't stand but lived all of 30 minutes. When confronted with undeniable evidence, Bill admitted he had "renched" her through the nose with a quart of epsom salt solution. Two other horses had died on this farm within the preceding three weeks from what, from the history, appeared beyond question to be cane poisoning. Bill thinks his luck has been bad this season.

Before leaving the farm a call relayed from the office was received. It was to a case of dystocia in a cow, eight miles further northeast. Circumstances like this explain why Doctor Baker's and every other successful general practitioner's car and equipment is a hospital on wheels.

The calf was delivered without difficulty and calf, cow and owner all were left happy and content.

Back at the office a man was waiting to know if I would go to see a steer that a quack had been treating for "compaction" for the past two weeks.

After getting a description, I made a very unfavorable prognosis but the man insisted and I consented to make the call. He lived in the next county; 28 miles away. Sixteen miles of hard road; eight miles that could be traversed by a car in low gear, if the driver were an expert and had plenty of patience and four miles of what the owner said hopefully "mebbe I could make it." I could and did but on foot, that last four miles was impassable for any car but a jeep. I think I'll get a jeep when the war is over and go back and drive over that road just to show the mountaineers it can be done.

I arrived at the farm at 6:00 p.m. The steer was suffering, not from "compaction," but from uremic poisoning; he was down and in a bad position for an operation. The only light available was my flashlight. Under local anesthesia a large calculus was removed from the urethra, just at the ischial arch, liberating at least two gallons of urine.

An unfavorable prognosis was given, along with directions for care of the animal, and I began to trudge the four weary miles back to the car. Even more wearily the chains were removed at the hard road and the office reached at last. It was 10:00 p.m. and two office calls yet waiting. But there is an end to all things, even to a day in rural practice, and ultimately I was in bed again. My last thoughts are of some new excuses for putting off a night call; but I recalled that there is nothing new under the sun.

I have seen many changes in 40 years of practice, but no change in the expectation of farmers that a veterinarian will come to his aid whenever he is wanted. Animal illness is an emergency on the farm. Loss of an animal, a tragedy to the family. If the time ever comes when rural practitioners refuse to make night calls or those involving particular hardship or where the pay will be long delayed, it will be an unfortunate day for the veterinary profession.

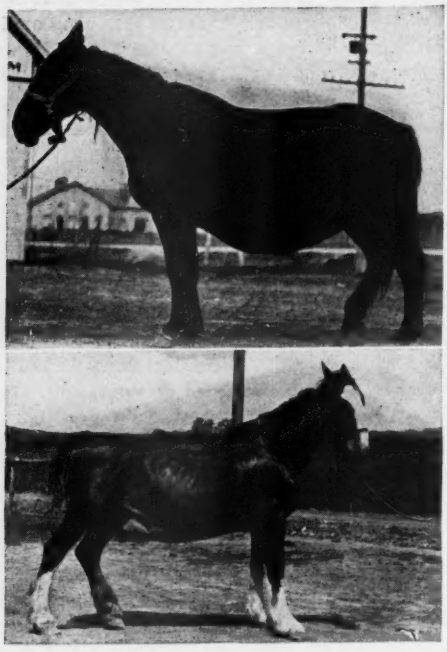
The steer back in the mountains fooled me by getting well promptly.

S. E. HERSHEY

Charleston, W. Va.

Rupture of the Pre-Pubic Tendon in a Non-Pregnant Mare

A seven-year-old buckskin mare, weighing about 1400 pounds and owned by Robert W. Black of Alta Vista, Kansas, was presented to the Veterinary Clinic of Kansas State College.



Above: A case of impending rupture of the pre-pubic tendon. There is great edema of the ventral wall of the abdomen, otherwise the organs are in normal position

Below: Definite rupture of the pre-pubic tendon. The mammary glands are in a forward position, the pelvis tilted and the back swayed

According to the owner, the mare had never raised a colt and, although broken to work, had not worked that season but had been running in the pasture. The only incident indicating a possible injury, as far as the owner had observed, was when he noticed her lunge to free herself from the deep mud of a bog below a spring in the pasture. This occurrence was so insignificant that he did not concern himself since the mare immediately regained solid ground, apparently uninjured.

After approximately 24 hours the owner observed a swelling in the area of the udder. A veterinarian was called, but no diagnosis was made and she was brought to the clinic.

When the mare entered the clinic, she appeared bright, with a normal appetite, normal temperature and, excepting the edematous area in the pre-pubic region which gave the udder the appearance of that of a mare at the termination of pregnancy, she appeared to be a vigorous healthy mare. The abdominal wall showed no weakness and the os coxae was apparently in natural position. Rectal examination disclosed nothing abnormal and, although injury to the pre-pubic tendon was suspected, no diagnosis was made.

The edematous condition advanced steadily and, on the third day after her arrival at the clinic, had extended to the axillary region; the mare had developed a tachycardia; had partially lost the use of the right hind quarter, and showed depression and anorexia; she arose with difficulty. On the fourth day prostration was complete and, upon attempting to rise, the animal assumed a position of ventral recumbency with the hind legs extended posteriorly.

The mare was destroyed on the fifth day after her arrival at the clinic. Necropsy showed almost complete separation of the abdominal muscles from their insertion on the pre-pubic tendon. The tendon maintained its pubic attachment but the separation appeared to be in the region of the blending of the tendon and the muscle fibers. However, tissue reaction after the lapse of so much time made it difficult to separate and identify individual structures and, no doubt, contributed to the difficulty of rectal diagnosis. Also, because of the struggling of the animal while prostrate, it was difficult to determine how much of the separation existed before prostration occurred.

The mare was of the rangy, long coupled type which, in this particular case, may have proved to be her undoing and, perhaps, is a predisposition that should not be too lightly considered in such cases.

OLIN MORRIS

Manhattan, Kans.

★ ★ ★ ★

★ ★ ★ BUY WAR SAVINGS STAMPS AND BONDS

Book Reviews

Diseases of Poultry by 34 high-ranking authorities on the subject. Edited by *H. E. Biester*, Veterinary Research Institute, Iowa State College, and *Louis Devries*, Division of Science, Iowa State College. Foreword by *John R. Mohler*, Chief of the Bureau of Animal Industry, U. S. Department of Agriculture. 1020 pages; 324 illustrations. The Iowa State College Press, Ames, Iowa, 1943. Price $8.50.

"Diseases of Poultry" is undoubtedly a most valuable and interesting text and one which the veterinarian and the research worker, as well as the teacher and the student, will find indispensable. The authors, editors and publishers are to be congratulated on this timely publication, as, in the reviewer's estimation, it is one of the most valuable publications put out in many years.

The volume is unique in several respects. First, perhaps, because it makes available in convenient and interesting form current information on the ailments of fowls. Heretofore this information was found largely only in separate bulletins or other publications of the several authors. It is now brought together by the editors into a single, comprehensive volume.

To be found in this volume are the statements of authorities who are especially trained in their respective fields. For example, one may conveniently and quickly ascertain what Meyer has written on psittacosis and ornithosis; Giltner on equine encephalomyelitis virus in birds; Burnett on fowl pox; or Hinshaw on diseases of the turkey—to name only a few of the subjects and well-known authors. Once perusal of a chapter has begun, one's interest is held to the end, so interesting and instructive is each presentation.

That there has been urgent need for a text such as "Diseases of Poultry" no one will deny. Those engaged in pure research usually have convenient access to institutional libraries and, therefore, are more familiar with the literature on their particular lines of work than is the case with the practitioner, but even they will find the text valuable. The duties and locations of most practitioners often make it difficult, if not impossible, to go over all library references bearing on the problem in which they currently may be involved. The interest and efficiency of the practitioner will be stimulated by reading the text and he will be more anxious to assume his rightful place in the control of poultry diseases. In addition, students who have used the book will be better prepared for practice or for research work. To many it has seemed that the interest of some practitioners possibly has lagged when it came to the consideration of poultry ailments. That this situation may, to some extent, be due to want of convenient source of information has been suspected. If the above is true, there is no longer any reason for a lack of interest.

Because of the considerable number of authors who have contributed to make the work of such great value, the reviewer of "Diseases of Poultry" is confronted with unusual difficulties. A satisfactory review would mean an abstract of each chapter which would make it unduly long.

To sum up, it is predicted that this timely and valuable text soon will be in the hands of every research worker, practicing veterinarian and student for the very good reason that they cannot afford to be without it. Again, we congratulate those responsible for supplying a text to fill a long-felt want.—*H. J. Shore.*

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Williams' Surgical Operations. *By A. G. Danks*, B.S., D.V.M., Professor of Surgery, New York State Veterinary College at Cornell University, with the collaboration of *J. N. Frost*, D.V.M., Professor of Surgery, New York State Veterinary College. 140 pages; 61 illustrations. Published by the author, Ithaca, N. Y., 1943. Price $2.50.

This work represents an extensive revision of "Surgical and Obstetrical Operations" by *Prof. W. L. Williams*, first published about 40 years ago. However, all reference to obstetrical operations have been deleted and the technic for some new operations has been added to the revised work. The text is in no sense intended to be a complete discussion on veterinary surgery but rather a guide to surgical exercises. Only the technic of operations is given; topographical anatomy, aseptic precautions, anesthesia, tissue invasion and suturing being discussed.

By omitting etiology, symptomatology, diagnosis and after care, the author has been able to include the common operations on the horse, except that for fistulous withers, several of the more common operations on the cow and one operation on the hog, within the small compass of this volume.

The predecessor of this work has long been a standard text in veterinary colleges and most readers are of course familiar with it. The new revision should be even more satisfactory as a student text, and of value to practitioners for review purposes and as a guide in surgical operations performed only occasionally.

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★ ★ ★ BUY WAR SAVINGS STAMPS AND BONDS

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Textbook of Meat Hygiene, with special consideration of Ante-mortem and Post-mortem Inspection of Food Producing Animals, by Richard Edelmann. Eighth revised edition by *John R. Mohler,* A.M., V.M.D., D.Sc., Chief, and *Adolph Eichhorn,* D.V.S., Director, Beltsville Animal Disease Research Center, Bureau of Animal Industry, U. S. Department of Agriculture, 468 pages, 169 illustration and five colored plates. Lea and Febiger, Philadelphia, 1943. Price $5.50.

The present edition of this standard work on meat inspection differs but little from the 7th edition which was reviewed in some detail.[1] The changes include: revision of the chapter on endocrine glands, recent amendments to federal meat inspection regulations and some new text material.

This new edition of "Meat Hygiene" is timely. Not only have we more meat animals and more meat to inspect than ever before in the regular channels of interstate commerce but as provided in the Act of Congress of June 10, 1942, abattoirs engaged exclusively in intrastate trade may be provided with federal inspection, under certain circumstances. In addition, large numbers of veterinarians in the army are now engaged to a greater or lesser degree in meat inspection.

Federal meat inspection has been synonomous heretofore with veterinary meat inspection. It is on this basis that our federal meat inspection has been accorded world wide distinction for honesty and efficiency. The Act of June 10, 1942, a copy of which is included in this text, authorizes the Secretary of Agriculture to employ any person as inspector "without regard to the Civil Service Act." Possibly it is this authorization that was basically responsible for the Secretary's order of Feb. 9th, 1943, transferring meat inspection from the Bureau of Animal Industry, which for 60 years had been a veterinary bureau, to the Livestock and Meats Branch of the Food Distribution Administration, which, being a new organization, is not concerned with tradition or custom.

In any case, veterinarians who undertake meat inspection will want the latest scientific information on the subject, and this information Mohler and Eichhorn's Meat Hygiene supplies.

[1] *Vet. Med.,* 34:10, p. 683 (Oct., 1939).

You may obtain any book reviewed in this department by remitting the published price to the Book Department of VETERINARY MEDICINE, 7632 S. Crandon Ave., Chicago, Ill.

Diseases of Feeder Cattle in Kansas, Circular No. 214. By *Herman Farley,* School of Veterinary Medicine, Kansas State College. Published by Kansas Agricultural Experiment Station, Manhattan, Kansas. Free.

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The Rabbit as Used in Disease Research, compiled by *Carlton M. Herman,* Sc. D., 519 mimeographed pages, 4,859 references, Fish and Wildlife Service, U. S. Department of the Interior, Chicago, Illinois, 1943.

This valuable bibliography was a W.P.A. project. An effort was made by Doctor Herman to include all published references to disease (both spontaneous or natural) and induced or experimental infections of rabbits of all species. To this has been added references of other bibliological experiments which might have a bearing on the health of rabbits either in the laboratory, in hutches or in the wild state. Included is a list of publication abbreviations and subject and author indexes.